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The myopathic uterus is usually a little enlarged, say, half an inch in each axis, and there is a curious subperitoneal mottling covering a hard spherical body. The muscular wall is much

thickened, pale and fibrous, with the cut vessels standing up from the section. The endometrium varies with the type and duration from juicy excess in the earlier stages to atrophy in the later stage. In very late stages one has the small, hard uterus with all the muscle replaced by fibrous tissue.

The histological picture varies. The connective tissue is increased between the muscle bundles, and especially along the blood vessels, where there is round-celled infiltration. As the condition progresses the fibrous tissue increases. We have always found the fibrous tissue most marked nearest the peritoneal surface. In certain cases, probably following a subinvolution, there is the persistence of much elastic tissue, especially in the old vessels of pregnancy as well as among the muscle bundles. There is always thickening of the media and intima of the vessel. The endometrial picture varies, but is usually, on our observation, not a marked feature, except in a small minority of cases presenting hyperplasia of endometrial glands with cyst formation.

The physical examination shows a woody hard uterus enlarged symmetrically and tending to be spherical, usually associated with chronic disease of the cervix. The uterus is rigid, so that if there be associated retroversion the uterus may often be axial in position, the rigidity not allowing the uterus to fall right back. In earlier cases the hardness is less pronounced. It is important in the differential diagnosis to consider: (i) carcinoma of the uterine body or tube, (ii) fibromyomatous polypus, (iii) endometrioma of the uterus.

These conditions can really be differentiated only by curettage, carefully done with microscopic examination when required.

Ætiology.

Now we come to the discussion of the ætiology and treatment, purposely left until the last. The ætiology is important, for upon it the treatment must largely depend. There are three views widely held: (a) That the myopathic uterus is inflammatory in origin and nature, and therefore that the term chronic metritis is accurate. (b) That the nature of the disease is not inflammatory, but that some other cause must be promulgated, endocrine dysfunction being most commonly invoked. Others consider it in the nature of a local arteriosclerosis. (c) That the great majority of cases (96% Fletcher Shaw) are of the nature of a chronic metritis, but that a small number of cases (4%) are due to endocrine irregularity.

We are convinced adherents of the first view on four main grounds: (i) The previous history of acute pelvic inflammation in almost every case. (ii) The wonderful change in sufferers after the performance of total hysterectomy. (iii) The almost universal association of the myopathic uterus with chronic cervical disease and adnexal disease. (iv) The distribution of the fibrous tissue in the most superficial part of the uterus, that is, immediately under the peritoneal surface.

These four grounds must be considered in detail:

1. How many times have we all not been greatly disappointed to find some years after salpingectomy for acute tubal disease that our patient has a uterus pouring away muco-purulent discharge and causing on the one hand daily misery from its excessive weight dragging on its attachments, and on the other hand infecting the ailing woman's blood stream with its debilitating toxins. In our experience the myopathic uterus is very common as a sequel to gonococcal or post-conceptional infections that have become chronic, especially when there has been long-standing tubo-ovarian, cervical or peritoneal involvement. The text books always lay too much stress on the ability of the uterus to recover and too little on the great amount of involvement of the uterus usually present in pelvic infections. The systematic examination by serial sections of these uteri has not been undertaken by us; though in chronic cervical metritis the gonococcus has been demonstrated in the deep fibromuscular tissue of the cervix (by H. H. Schlink and others). Even if no organisms could be found, it would not disprove the fact of infection which had died out, for in very many cases of chronic pyosalpinx no organisms can be found in the pus or tissue removed. One might say that in the same way that hydrosalpinx is a late stage of pyosalpinx so the myopathic uterus is a late stage of acute metritis.

2. The magnificent improvement in patients after hysterectomy, their loss of toxic symptoms, improved colour and appetite need no elaboration and may be compared with the results following the removal of any other chronically inflamed organ, for example, appendix, gall-bladder, prostate or tonsils.

3. Too long has the pathology of pelvic infection been divided into water-tight compartments. The cervix and the body of the uterus are in continuity and in our experience chronic cervical disease is invariably present in cases of myopathic uterus. In reality every case of pelvic infection of real severity involves all the female pelvic organs with a maximum incidence on one or more units. (This does not apply to purely contact infection from appendiceal abscesses, diverticulitis *et cetera*.)

4. Leopold many years ago pointed out the continuity of the uterine lymphatics, both in a horizontal and vertical direction. The lymph spaces communicate from the interglandular spaces in the endometrium through the intermuscular spaces to the subperitoneal network, where the vessels run both vertically along the surface of the uterus and also transversely into the broad ligament. Leopold also found that the lymph vessels are most abundant in the external muscular layer, which accounts for the fact that the fibrous tissue in the myopathic uterus is much more abundant in the outer part of the uterus. Thus a chronic lymphangitis can arise from cervical or corporeal endometrium by direct lymphatic continuity transversely or longitudinally.

Those who regard the disease as not inflammatory do so because they say the histological evidence is incomplete. They are usually pathologists who deal with the removed material at only one stage of this disease. They say that the small round cells *et cetera* characteristic of chronic inflammation are absent. In order to convince them it would be necessary to get examples of the disease at all stages, which is very difficult, because in early stages we are hopeful of recovery. The promulgation of the theory of endocrine dysfunction is an attempt to account for the condition without at present any positive evidence.

About 4% of cases are associated with endometrial hyperplasia, in some cases cystic, and R. Schroeder believes that there is an anatomical explanation in the persistence of Graafian follicles which do not properly evolve, but persist in their ripened condition and even hypertrophy abundantly. He states that a *corpus luteum* is completely absent. "Just from this lack of a young *corpus luteum* can one conclude unequivocally in the persistence of the follicle." The folliculin so secluded is a very strong stimulus to endometrial proliferation which reacts in a markedly pathological manner. The mucosa thickens greatly and becomes polypoidal, the gland picture becomes atypical and in some parts cystic. There is no stimulus to the shedding of the normal menstrual products and no *corpus luteum* hormone being produced. This condition is, according to Fletcher Shaw and others, associated with marked fibro-muscular hypertrophy, causing typical symptoms of myopathic uterus. As Stoeckel, of Berlin, in his latest text book says, in the absence of experimental production of these changes negative reasoning alone is available. It is quite possible that the endometrial proliferation is due to a wave of influence passed from the ovaries. We have not yet seen this class of case often enough to make any comment on the above description. The theory of arteriosclerosis really only substitutes one term for another and is not an explanation, but a statement of one pathological feature.

Treatment.

Treatment may be classified as follows:

Palliative

Medicinal (iodide and ergot)

Rest

Curettage

Plugging

Surgical procedures

Removal of ovaries

Utericoplasty

Amputation of cervix

Radiation

X rays

Radium

Radical surgery

Hysterectomy

(a) Subtotal with enucleation of cervix

(b) Total

With regard to drugs in out-patient practice, iodide of potash, 0.3 to 0.6 gramme (five to ten grain) doses, has been found useful in association with the usual ergot mixture.

Curettage has been performed alone 24 times at the Royal Prince Alfred Hospital in the last 150 cases, and though frequently a therapeutic failure, is always a diagnostic success, provided that the scrapings are always referred to a competent pathologist. No deviation from this rule is permissible, as early malignant disease is so easily overlooked.

Statement of Statistics of Myopathic Uteri Treated at the Royal Prince Alfred Hospital since the Radium Clinic was Started.

| | |
|----------------------|-----------|
| 1928— | |
| Hysterectomy | 17 |
| Radium | 4 |
| X rays | Nil |
| Curettage | 7 |
| No treatment | 2 |
| 1929— | |
| Hysterectomy | 8 |
| Radium | 1 |
| Curettage | 3 |
| 1930— | |
| Hysterectomy | 19 |
| Radium | 8 |
| Curettage | 4 |
| No treatment | 2 |
| 1931— | |
| Hysterectomy | 26 |
| Radium | 4 |
| Curettage | 8 |
| 1932— | |
| Hysterectomy | 29 |
| Radium | 4 |
| Deep X rays | 1 |
| Curettage | 2 |
| No treatment | 1 |
| Total— | |
| Hysterectomy | 99 |
| Radium | 21 |
| X rays | 1 |
| Curettage | 24 |
| No treatment | 5 |
| | <hr/> 150 |

Removal of ovaries will not always cure the bleeding from a myopathic uterus and presents no advantage over hysterectomy. Utericoplasty must be abandoned if one believes in the inflammatory origin of this disease. In certain selected cases, especially of Schroeder's endocrine dysfunction class, where pregnancy is still desired, it might have a place. Bonney, who introduced the operation, recorded two cases of successful pregnancy.

Amputation of the cervix will undoubtedly effect a cure in earlier cases, provided the corporeal myometrium is not too greatly involved, but too often amputation is followed by a most persistent and distressing discharge from a diseased uterine body.

Irradiation.—Out of 150 patients treated since the inception of the radium clinic at the Royal Prince Alfred Hospital, 21 were treated by radium and only one by X rays. The experience is therefore too small, but in the follow-up we have had at least five disappointing results, hysterectomy being required later for one of these conditions: recurrence of hemorrhage, excessive pain, or continuance of discharge. It was long ago proved by Bland

Sutton that a myopathic uterus will still bleed after removal of both ovaries, so that if irradiation depends for its efficiency on its effect on the ovaries, it is not surprising that recurrences occur. At the Royal Prince Alfred Hospital different doses, varying from 900 to 3,000 milligramme-hours with the same screening, namely, one millimetre of platinum, have been used, a 50 milligramme tube enclosed in rubber usually being employed. The object of the smaller doses was to endeavour not to affect permanently the menstrual function, but it is considered that for a satisfactory curative result at least 2,000 milligramme-hours are necessary. In view of the pathology of this complaint, associated as it is in most cases with chronic infection, it is only logical to expect that the uterus will remain painful after irradiation, as also discharge may recur. In many cases the toxæmia still remains. We believe that irradiation treatment should be reserved for patients refusing operation and for those with definite contraindications to hysterectomy. If radium is to be used, a careful diagnosis to exclude inflammatory disease of the adnexa and malignant disease is essential. (Here it may be said that radium treatment for uncontrollable hæmorrhage in very young women is entirely different, for the uterus in these cases is usually healthy.) The risk of malignant disease occurring in the uterus still remains after irradiation. Dyspareunia also is not cured by this treatment in our experience.

Hysterectomy.—The results of hysterectomy in these cases have been so brilliant as to need no advocacy. The bleeding, pain and discharge are cured in one act. The diseased tissue is got rid of entirely, the source of toxæmia is removed, no malignant disease can occur, for there is no residual uterus, and dyspareunia is cured. Thousands of invalid women have been transformed and rejuvenated by this operation.

The operation of choice is subtotal hysterectomy with enucleation of the cervical endometrium. This is rendered easier by the use of a special cervical enucleator devised by H. H. Schlink. This operation is simple and of low mortality and gives splendid results.

Total hysterectomy is necessary in some cases associated with much laceration of the cervix or with suspected malignant disease. It is always adequate, but is more difficult, more risky, and has certain mechanical defects.

The classical subtotal hysterectomy is quite unsuitable for these cases, as it fails to remove the cervix, which is often a most important part of the diseased uterus and the source of infection.

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A SERIES OF MYOPATHIC AND MYOMATOUS UTERINE CONDITIONS TREATED WITH RADIUM.¹

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You will notice that my observations tonight will not be limited to the myopathic uterus. Seeing that it fell to me to deal with our subject especially in regard to its treatment with radium, I asked permission to digress in my paper, feeling that it might be of interest to include the work we have been doing in treating uterine myomata with radium, and also feeling that it was not such an enormous digression, seeing that in both conditions the result hoped for is usually the same—relief of the associated menorrhagia.

May I say in beginning that I intend no apology for the oft-repeated use of the personal pronoun "we", feeling that in most work along new lines progress is to a certain extent achieved through listening to the experiences of individual workers?

It is customary when expressing thanks to a *confrère* to do so at the conclusion of a paper. Tonight I would depart from custom and render my thanks here at the outset. Seventy-five *per centum* of the cases dealt with are not my own, but have been treated by my senior colleague at Sydney Hospital, Dr. Cedric Bowker, while I have filled the rôle of "looker-on". Further, he has seen a majority of those that I have dealt with myself. In these circumstances I must thank Dr. Bowker, primarily for permission to include and use his cases, but more especially for his constant advice, assistance and encouragement in the small portion of this work which I have done, feeling that the credit attached to our immediate good results belongs entirely to him.

When dealing with a series of only thirty treated cases, one is able to deduce little and claim less, but seeing that some of the patients were treated over two years ago, this paper may induce those who are against the use of radium in this type of condition to regard it in a more favourable light in the future. I have collected the cases treated since January, 1931. In all the outstanding symptom was persistent menorrhagia. That surgery has not been abandoned for radium in treating these conditions is seen from the fact that in the period reviewed (two and a half years), out of a total of 110 patients with fibromyomata treated, sixteen (14%) were treated with radium, while out of 171 patients with menorrhagia (fibroids included) 30 (17%) were treated with radium. I intend to give briefly the lines along which the patients were treated, what we have considered contraindications and unsuitable cases, the dosage employed and, finally, the results and sequelæ noted to date.

¹ Read at a meeting of the Section of Obstetrics and Gynaecology of the New South Wales Branch of the British Medical Association on June 21, 1933.

Contraindications to Radium Treatment.

I think it as well at this stage to give the general contraindications to the use of radium in this field of pelvic work.

1. *Metabolism and Diabetes.*—The urine should always be examined for the presence of sugar and diacetic acid, for if they are present and radium is used, an intense inflammatory reaction often results with poor and slow healing. If the total daily output of sugar is more than twenty grammes, if diacetic acid is present, or if the blood sugar is increased in amount, radium should never be employed until these conditions have been appropriately treated. If metabolism is impaired and there is defective excretion of nitrogenous waste products, the application of radium should be deferred.

2. *Anæmia.*—A full blood count should always be performed, for intense radiation often produces a leucopenia and, should it be necessary to repeat the radiation, there is often an immediate decrease in the number of red cells and in the hæmoglobin content. (Recent work goes to show that in most cases the red count taken at the end of treatment for malignant disease reveals a slight increase in the number of red cells in the blood.) In cases in which there has been severe, frequent or prolonged hæmorrhage, radium should not be employed until the blood picture has been improved, otherwise there may be produced by it a degree of anæmia which, superimposed on that already existing, may possibly prove fatal. As a good working rule a hæmoglobin index below fifty or a red cell count below three millions per cubic millimetre can be considered a contraindication. In one case in the series we had recourse to blood transfusion before treatment.

3. *Lowered Resistance.*—If the patient is emaciated or cachectic radium can be used with more freedom in treating innocent pelvic disorders than in those malignant, for it is generally agreed that the occasional untoward results seen here in malignant disease are due to autointoxication from the breaking down carcinoma, especially if the growth is large.

4. *Pelvic Inflammation and Sepsis.*—If there is evidence of pelvic inflammation and sepsis especial care must be observed, the majority of the bad results seen arising from some inflammatory pelvic condition being overlooked by the operator. The bimanual examination must therefore be made with the greatest care, with an eye to the detection of any inflammatory condition in the uterus, adnexal organs or pouch of Douglas. Pyosalpinx, oophoritis, salpingitis or pelvic abscess are absolute contraindications, for a severe peritonitis with possible fatal end results is sure to result if radium is used when these conditions are present.

Contraindications to Operation.

Contraindications to operation are to be accepted as indications for the use of radium. Those most commonly met with include nephritis, severe cardiac disease, pulmonary conditions, hyperthyroidism, certain hæmatopoietic diseases and very occasionally obesity.

The chief advantage claimed for the use of X rays instead of radium in these cases is that this form of treatment does not call for hospitalization of the patient. It, however, has the disadvantage that, except when the dosage is very small, X rays cause nausea and malaise in a large number of patients.

Each year now sees cavitation irradiation of the uterus (the method used in our series) being successfully used in an increasing number of cases of pelvic disorders associated with irregular and excessive hæmorrhage. In this paper the term *menorrhagia* is used in the widest sense in an attempt to cover all these conditions. They fall into two groups: (a) myopathic conditions, (b) myomatous conditions, and can be further subdivided as follows: (i) Essential or idiopathic menorrhagia. This to include all irregular excessive uterine hæmorrhage in which no organic cause can be determined. While the majority of these are menopausal conditions, quite a few occur in younger women with no physical signs of pelvic disease. (ii) Menorrhagia due to inflammatory and degenerative conditions. In this group are included those cases in which an organic cause other than fibromyomata is discovered, for example, *fibrosis uteri*, chronic metritis, chronic endometritis, subinvolution. (iii) Menorrhagia due to fibromyomata.

Good results have been obtained in all three groups, but more especially in the first group, where it is possible to predict results with greater certainty according to age and dosage.

Technique.

Seeing that the treatment is carried out, in the main, in the same manner in each of these three groups, I shall outline it at this stage and then deal with each group in turn.

The dosage to be employed is determined by a multiplication of the number of milligrammes of radium element used and the number of hours during which it is applied, the dose being given in milligramme-hours of radium element. For example, 40 milligrammes of radium used for 50 hours equal 2,000 milligramme-hours radium element.

As a routine we have used from thirty to fifty milligrammes of radium element (usually forty milligrammes) and have thus varied our doses by varying the number of hours during which we have employed this forty milligrammes of radium. We generally use two tubes, each of twenty milligrammes of radium, and place them in tandem (end to end). These tubes have a screening each of one millimetre of platinum, and they are placed in a rubber tube (two millimetres thick), this providing the secondary filtration for the radium. The applicator so formed is approximately four to five centimetres in length and is about the thickness of an ordinary lead pencil and has a silk thread secured to its distal end.

In all cases the urine is tested, a full blood count is made, and a Bordet test is performed.

The treatment is performed under general anaesthesia (no anaesthetic is given in Continental

clinics) and after a particular vaginal cleansing a careful bimanual examination is carried out. Here conditions which may contraindicate the use of radium are sought, while if a fibromyoma is under consideration its peculiar characteristics are noted.

Dilatation of the *cervix uteri* follows (if a fibroid or cervical polypus is encountered it is removed at this stage). The uterus is then curetted. The scrapings obtained here are always submitted to pathological examination.

The applicator containing the radium in tubes is then inserted into the uterine cavity, being pushed right up to the fundus, so that no portion protrudes. The silk thread attached reaches to the vulva. We have at times drawn the lips of the *cervix* together with a single thin catgut suture.

The vagina is then firmly packed with iodoform gauze. This serves a double purpose. It tends to prevent the applicator from slipping down into the vagina, while it serves as an extra protection to the bladder and the rectum. The labia are then drawn together with a single superficial catgut suture to retain the gauze.

At the end of the time determined upon the radium contained in its rubber sheath is easily removed (without anaesthetic) by gentle traction on the attached silk thread.

The Action of Radium in the Pelvis.

As regards the pelvic organs, radium in moderately large doses has a threefold action:

1. In the endometrium it causes local necrosis, leaving it shrunken and atrophic after healing.

2. In the uterine muscle (and fibromyomata) it stimulates scar tissue formation. After contraction in this scar tissue obstruction to blood vessels is produced, which means a considerably lessened blood supply to the uterus (and fibromyomata). This is naturally followed by atrophy in the uterus (and fibromyomata).

3. In the ovary it inhibits further growth in young follicles, but mature follicles are not affected. Atrophy of the ovary eventually occurs, all primordial follicles disappearing, and the organ becomes smaller, wrinkled and fibrous.

To digress a little, it is interesting to observe that "recurrence" (speaking of menorrhagia) has an important bearing on how radium achieves its results. The results following its application (namely, fibrosis of the uterus with thickening of its blood vessels) are factors which should tend to aggravate rather than arrest uterine hæmorrhage. The former interferes with muscle contraction, the latter with retraction of vessels. One would think that, short of complete destruction of the endometrium or obliteration of the cavity, nothing could be alone responsible for arrest of bleeding, and these results have not been observed.

It is also interesting to note that when tissues previously irradiated are operated on, there is often an unusual degree of hæmorrhage. A greater number of vessels bleed, and there is less tendency

to spontaneous arrest of bleeding. Sections of such tissues show great thickening of the blood vessels, the muscle coat being interspersed with fibrous tissue, while the elastic coat to all appearances remains unaffected.

Essential Menorrhagia.

As already stated, essential menorrhagia includes menorrhagia in young women during the period of sexual maturity and also that in older women at their menopause. In the first mentioned much further investigation of the ovary and its function, as well as of the other endocrine glands, is needed to explain fully the underlying trouble. Once those conditions belonging to Groups (ii) and (iii) have been excluded, there still remains a fairly large number of cases in which neither these conditions nor any general endocrine disease can be discovered. In most of these the uterus, which may be anterior or posterior, is enlarged and boggy, the adnexal organs being normal. Sometimes curettage reveals a normal endometrium, sometimes a condition of stationary hyperplasia. Further investigation has shown that some of these have a *corpus luteum*, while others, although showing no *corpus luteum*, show excess atresia with polycystic ovaries, which are capable no doubt of producing quite a quantity of hormone. If the usual recognized methods of treatment have been tried without success, radium treatment must be considered.

As regards the climacteric cases, again the outstanding symptom is menorrhagia, and there is no apparent clinical abnormality on examination. Curettage reveals an endometrium frequently cystic and hyperplastic, but not infrequently affords the patient no relief. Radium treatment can be undertaken in these cases with the greatest confidence, for our work shows that the results are excellent.

In the series under consideration the only patients treated belonging to Group (i) were those with menopausal conditions, with the exception of one young woman of thirty-two years of age (I shall give her history in detail later on). Of course, it must be conceded that here radium treatment aims as much at relieving a symptom as at curing an underlying morbid condition and as such a cure is claimed if: (i) amenorrhœa results, (ii) the menses continue but cease to be excessive (this is the result aimed at in treating young women in this group).

Some, however, maintain that often, even though these results are obtained, they must be classed as failures in that such severe menopausal symptoms supervene that the patient derives no benefit from the treatment. While the number we have treated is not sufficiently large for us to comment dogmatically on this, it is interesting to note that in every case in which menopausal symptoms have been caused, they have never been so severe that they could not be effectively controlled with "Prokliman" (Ciba) and similar preparations. The fact that we have employed smaller dosage than that generally used may help to explain this. In

this regard I might mention that I have found "Prokliman" by far the most efficacious preparation which I have employed as an adjuvant in these conditions.

Others again maintain that in treating young patients radium should not be used unless a dose large enough to sterilize the patient is employed, arguing that the future children of these women, if the pregnancies should go to term, may be abnormal, mentally or physically. While this has been the result in some cases, there are, however, recorded cases in which women so treated have borne children perfectly healthy, physically and mentally. I should like to give in detail now the case records of the patient aged thirty-two (already mentioned), whose menorrhagia, to my mind, was of this type, although many will no doubt classify it as a case of subinvolution.

L.S., aged thirty-two years, had had three children and two miscarriages. Her uterus was curetted after a six weeks' incomplete miscarriage. She was in bed for six days, but bleeding started after she got up. This continued off and on for three weeks and then became profuse. After a further two weeks of free bleeding she was admitted to hospital in a weak condition. She had thus on admission been suffering from bleeding for six weeks.

On examination on November 9, 1931, the uterus was normal in size, firm in consistency, freely mobile, not tender. The cervix was normal, the os was firmly closed. The pelvic organs were normal. The urine was normal. The Bordet test gave no reaction. The blood contained four million red cells per cubic millimetre. Curettage was performed; the scrapings were scanty. Pathological examination of these revealed no evidence of placental tissue or of malignant disease. As the hæmorrhage still continued in spite of this operation and as the preparations given by mouth were apparently equally ineffective, on November 24, 1931, two tubes, each containing 25 milligrammes of radium screened with one millimetre of platinum and two millimetres of rubber, were inserted into the uterine cavity in tandem for forty hours. The dose was 2,000 milligramme-hours radium element.

The patient then had a period of amenorrhœa from this date until July 17, 1932 (eight months later), when she had a five-day normal, painless period. (Her previous menses had always given rise to some dysmenorrhœa.)

Subsequent menses, each of five days' duration, with normal loss, have occurred on August 11, 1932, September 6, 1932, and October 2, 1932.

Naturally, decided differences of opinion are held as to what period should be allowed before a patient can be definitely signed up as cured. In speaking of recurrence, it is not implied that hæmorrhage is excessive, but simply that bleeding occurs again. As already stated, recurrence after eight or nine months is quite common and is the result aimed at in young subjects. It is as well to mention here that all patients treated by this means should be warned that there is a probability of their having a period (three to six days) of free bleeding some time after the radium application. This is not uncommon, the bleeding generally showing itself from four to six weeks after the application. Some men have noted recurrences as long as six or seven years after treatment, but all these patients have been over fifty years of age, and after malignant disease has been excluded by curettage and pathological investigation, they have been again treated with radium. What is the correct dosage to employ

when treating these patients? As in most questions concerning radium dosage, differences of opinion are noted. However, those who have had the opportunity of treating considerable numbers maintain: (i) In women over forty-five years the dose should be from 1,500 to 1,800 milligramme-hours radium element. (ii) In women between forty and forty-five years the dose should be from 1,800 to 2,000 milligramme-hours radium element. (iii) In women between thirty-six and forty years the dose should be 2,000 milligramme-hours and over, with higher dosage still for women under thirty-six years of age.

In our cases the immediate good results have been obtained with doses generally smaller than these (up to 20% less) and we feel that the future tendency will be in the direction of decreased dosage, especially when it is remembered that should the dose initially used prove insufficient, it can always be increased by a second application. As already stated, we have usually used thirty to fifty milligrammes of radium element in treatment, varying the time during which it is applied to obtain the difference in dosage required.

Menorrhagia due to Inflammatory and Degenerative Conditions, Menorrhagia due to Fibroids.

You will observe that Groups (ii) and (iii) are here grouped together. In each there is a definite organic abnormality detected and they also tend to fall into a common group as regards treatment, that is, dosage. In the small series of cases (thirty) under review, more than half have been fibromyomata with menorrhagia the outstanding symptom.

The other group includes those conditions variously styled "*fibrosis uteri*", "subinvolution", "chronic endometritis" and "chronic metritis". (The last named must, of course, be distinguished from true chronic metritis of inflammatory origin.) In these cases we have a hard uterus which is slightly enlarged yet symmetrical. The prominent symptom complained of is menorrhagia. If the uterus is examined under the microscope, it will be found that there has been a great replacement of muscle tissue by fibrous tissue. The arteries are "pipe stemmed" and often a markedly hyperplastic endometrium is seen. It was these appearances which gave rise to these cases being described at various times as "*arteriosclerosis uteri*" or else "chronic metritis" and sometimes "*metrorrhagia myopathica*". The majority of these cases occurred in multiparous women who also complained of back-ache, leucorrhœa and, of course, anemia resulting from the menorrhagia and metrorrhagia.

The enlargement of the uterus and the bleeding are explained by many as due to over-function of the ovaries, which tends to a chronic hyperplasia of both endometrium and musculature, the fibrotic myometrial changes eventually taking place. Those who explain these conditions in this way also point to the resemblance between uterine fibromyomata and adenoma of the prostate, and also to the evidence to hand which shows how hyperfunction of

the ovaries in nulliparous women favours the appearance of myomata, just the same as withdrawal of this influence by castration favours the disappearance of myomata.

While the treating of a small series may not permit of decided opinions or conclusions, it is felt that in certain suitable selected cases of this nature (fibrosis and fibroids) radium gives excellent and satisfactory results. It carries a negligible mortality rate, 0.5% to 1.0%, obviates the necessity of a serious abdominal operation, giving a shorter period of disability and morbidity (at maximum seven days) and in one of our cases was probably the means of saving life. By this it must not be thought that surgery should be thrown to the winds and all patients treated with radium. This impression is not intended, but in quite a few of our cases Dr. Cedric Bowker expressed the emphatic opinion that hysterectomy (total, of course) would have been attended with very grave risk which he felt the use of radium had eliminated. Certainly hysterectomy should carry a low mortality rate, yet every gynaecologist will admit that he has often approached an operation of this type with uneasy mind.

As regards the suitability of fibroids for treatment by radium, it is generally accepted that if the myoma is larger than a four months' pregnancy, it is unsuited. A similar objection applies to degenerating fibroids. If pedunculated fibroids are treated with radium, they tend to necrosis and may as a result become infected, causing peritonitis or even general sepsis. Further, if necrosis is caused in this way, adhesions, with their attendant pain and suffering, will often tend to follow.

In these groups again the dosage we have employed has been considerably less than that used abroad (in some cases from 20% to 25% less), yet in only one case did we have to supplement the initial dose to obtain the desired result. Here, too, difficulty as regards hard and fast rules for dosage obtains, but it is generally agreed that the doses used in the "essential" group prove inadequate in the same age groups where the bleeding is associated with definite organic disease. In cases treated with a dose under 2,000 milligramme-hours there are a larger percentage of failures than in the "essential" group. The determining factor in this is uncertain, but it is not the size of the uterus, seeing that not a few cases in this group show a uterus which is enlarged to a very slight degree. One thing, however, is certain, and that is that the age factor plays exactly the same part as in the "essential" group—the younger the patient, the greater the dose necessary for success. In our cases the age of the patient varied between twenty-six and fifty-seven years, the size of the uterus from normal to that of a sixteen weeks pregnancy, and the average dosage used was 1,750 milligramme-hours (minimum 1,200 milligramme-hours, maximum 2,500 milligramme-hours). While workers abroad have used doses up to 5,000 milligramme-hours, the average appears to range around the 2,500 milligramme-hour mark.

Every patient treated had menorrhagia—the indication *par excellence* in these cases for radium. The effect of treatment in all (two patients who live at a distance from Sydney have not returned for examination, but write that they are well and free from bleeding) was to bring about (in fibroid cases) a decrease in the size of the tumour. Others who have treated larger numbers report cases (in one series, five out of one hundred and two treated) in which the hæmorrhage was uncontrolled and the tumour continued to increase in size. These were failures and the patients were, of course, operated upon.

Strong objection is often raised to the use of radium in this class of case if a diseased *cervix uteri* is present, in that there remains after treatment a site for malignant invasion. Some of the patients we have treated were possessed of unhealthy cervixes. Where vaginal discharge was complained of we generally found a decrease in the amount after using radium, while the general changes noted in the cervix itself were in the nature of atrophy. It has, however, been our practice to subject the cervix to appropriate treatment three months after the use of the radium, if it were considered unhealthy.

Another objection is that some fibromyomata are sarcomatous. While this must be admitted, the number must be small—certainly not greater in percentage than the mortality rate after hysterectomy.

Further, while it is admitted that in a patient over forty-five years of age a total hysterectomy sometimes acts like a charm (as one of our eminent gynaecologists has stated, "in the same way as prostatectomy in an elderly man") and gives a new lease of life, it must also be remembered that quite a few women never seem to recover completely from the shock attendant upon a big abdominal section—they are never quite the same again.

Further, we as gynaecologists are prone to overlook or at least regard lightly the strained relations which sometimes result between man and wife if the woman has had hysterectomy performed, even though the ovaries are untouched. Not infrequently the husband contends that his wife is not the same in that she is now "unsexed". In the series I mention one case which is classed a failure (the only one) in that the patient was operated on after being treated with radium. We feel, however, that in view of her age and the small dose used (it was purely experimental) we were justified in expecting a "cure" had consent been obtained to the dose being augmented by a second application.

A.B., aged thirty-two years, married, had had two children and no miscarriages. She complained of excessive loss at the menses during the past ten months. The menses lasted ten days in place of the usual four days. Menstruation was of the twenty-eight day type. On March 31, 1932, curettage of the uterus was performed.

Three tubes, each containing ten milligrammes radium element, screened with one millimetre of platinum and two millimetres of rubber, were inserted into the uterus for twenty-four hours. The dose was 720 milligramme-hours radium. The uterus was slightly enlarged, several

small intramural fibroids being felt. The uterus was mobile, but not tender. The cervix and other pelvic organs were normal.

The next period lasted five days and was followed eighteen days later by one of seven days' duration, and again fourteen days later by a third lasting eighteen days. The patient positively refused further treatment with radium, declaring that it had failed once and could not succeed if used again.

On October 22, 1932, as free bleeding was still occurring, section was done and a total hysterectomy was performed. It is interesting to note here that most observers claim that if operation is contemplated after the intrauterine application of radium, it should be performed not more than six weeks later, otherwise the dense fibrosis produced will render the operation very difficult, sometimes impossible. In this case I operated eleven weeks later and saw no evidence of reaction in the pelvic organs, the ovaries to the naked eye being normal. Further, the operation was carried out without difficulty. No doubt the explanation lies in the small dose (720 milligramme-hours) which was used on this occasion.

A second patient, a woman thirty-nine years old, was given a dose of 1,160 milligramme-hours radium, and this was supplemented eight weeks later by a further dose of 960 milligramme-hours radium. The second dose succeeded in arresting the bleeding where the first had failed, and there has been no recurrence to date (twenty-one months later).

In view of this we feel that, had we received permission, we should have been able to present a small series with no failures to date, instead of one as I have described.

I should like to give some details of the case, which was very desperate and in which we decided to use radium instead of operation.

F.A., aged fifty years, had had eight children and no miscarriages. She complained of severe loss at the menses over a period of four years' duration. During the last two years she had become worse and now had menorrhagia, metrorrhagia and marked dyspnoea. The menses lasted for ten to twelve days and occurred every eighteen to twenty-eight days.

On examination on March 2, 1932, a large fibromyoma was found pushing the bladder down to the vaginal orifice, bulging into the fornices and reaching half way to the umbilicus. The cervix uteri was small and lacerated. The urine was normal. The Bordet test gave no reaction. Examination of the blood revealed three million red cells per cubic millimetre, the hæmoglobin value was 45%, and the colour index 0.5.

On March 2, 1932, blood transfusion was performed. On March 3, 1932, four tubes, each containing 10 milligrammes of radium, with a filter of one millimetre of platinum and two millimetres of rubber, were inserted into the uterus for sixty-two and a half hours. The dose was 2,500 milligramme-hours radium element.

On July 14, 1932, the patient had had no bleeding since the radium was used. Vaginal discharge was very slight. The patient had no flushes and felt wonderfully well. She thought she had benefited greatly from the treatment.

On August 18, 1932, a tumour was just felt above the *symphysis pubis*. No bleeding had occurred. This patient lives in the country and cannot come for frequent examinations.

These patients, together with patients with malignant disease treated with radium, are seen at a special clinic every three weeks, if they live in the metropolitan area, for "follow-up" purposes. If they live at long distances in the country, they are kept in touch with by letter and come for examination at longer intervals if free of symptoms.

It is fitting at this stage to thank Dr. S. Bray, who is in charge of the radium at Sydney Hospital, for the valuable help which she gives in keeping our follow-up records so complete, and also for her help to me in collecting the records of the cases discussed in this paper.

It is astounding at times to see the rapidity with which some of these tumour masses decrease in size, while others, of course, are much slower. The comparatively few that we are as yet concerned with are still under observation and all are progressing satisfactorily. One fibromyoma reaching to 3.75 centimetres (one and a half inches) below the umbilicus, was commencing to block the patient's colostomy, and after being treated with a dose of 2,500 milligramme-hours was barely palpable above the *symphysis pubis* seven weeks later.

Sequelæ.

Menopausal Symptoms.—Irradiation sufficient to produce amenorrhœa also induces the same symptoms as the natural menopause. Headache and vasomotor disturbances are those most commonly noted. While they vary a good deal in intensity, we have yet to see a case in which they were so distressing that the treatment could have been said to have given no benefit. In quite a few cases these menopausal symptoms had appeared before treatment. We found that in these cases there was no aggravation of the symptoms, and in many they caused no inconvenience. "Prokliman" and similar glandular products alleviated the symptoms of many patients to a marked degree. Some men who have observed a large number of treated patients estimate that in a majority the duration of menopausal symptoms after use of radium (judged by vasomotor upset) is more than five years, and also state that after large doses the symptoms are of shorter duration.

Burns of the Vagina.—Burning of the vagina is preventable and should not occur. In the rare cases in which it has been noted it is most probably explained by the radium slipping out of the uterus into the vagina. Even then the radium would need to be insufficiently screened. We employ a filter of one millimetre of platinum and one to two millimetres of rubber, and have yet to see this complication.

Atrophy of the Vaginal Cervix.—In quite a number of cases there is noted atrophy of the vaginal portion of the cervix after the treatment, the external os presenting itself to the examining finger as a dimple in the vaginal vault. When a dose of 2,500 milligramme-hours or more is employed this change is not uncommon. It has occurred in this series of cases.

Vaginitis.—Vaginitis may be either purulent or adhesive. The former is rare, but when present is somewhat chronic; but although it causes a profuse discharge, this ultimately subsides. Adhesive vaginitis is commoner and, although the anterior and posterior walls adhere, the adhesion is generally

not dense and generally affects the walls only at the upper end of the vagina. Fibrous bands are rarely seen, the adhesions being filmy and easily separated by the finger.

Stenosis and Shortening of the Vagina.—Although stenosis and shortening of the vagina were not seen in any of our cases, they have been noted once or twice by others. They are thought to be due to the dosage employed (in one case 4,200 milligramme-hours element). A much more likely explanation, to my mind, seeing that stenosis and shortening are not uncommon after treating malignant disease by radium inserted into the vagina, is that they were caused by the radium slipping down out of the uterus. One worker states that he has not seen an instance since discontinuing the use of spirit on the vaginal plugging. Within two months of the application the canal cicatrizes in all directions, the finger entering only about one inch. The mucosa, however, remains intact, and there is an absence of ulceration or bleeding. This change is apparently located in the submucosa and is fibrotic in nature.

Rectal and Bladder Symptoms.—Rectal (proctitis) and bladder (cystitis) inflammation should not and do not follow where intrauterine application only of radium is used.

Malignant Changes.—At University College Hospital radium has been used in the treatment of non-malignant conditions since 1921. In all, 265 cases have been treated and in no case has malignant disease been noted as supervening in any uterus subjected to radium treatment for any type of menorrhagia. In all cases of recurrence curettage has been carried out to exclude malignant disease before the treatment has been continued.

Other Sequelæ.—Dyspareunia has been occasionally reported after the use of radium. In some there was associated *kraurosis vulvæ*, but whether the radium was a causal agent could not be determined. Those of our patients questioned in this regard have given a negative reply, and not one has complained of this symptom.

Conclusions.

I quite realize that the cases discussed are far too few in number and that the patients have not been observed for a sufficiently lengthy period yet for any definite claims of cure to be made; and I am naturally diffident about giving any conclusions from the work done in this comparatively new field.

We do, however, feel that every case of this nature should be treated on its merits and as a separate problem, and not that total hysterectomy should be the treatment in every case to the exclusion of radium or *vice versa*. While in the majority the indications will be towards treatment by total hysterectomy, there still remains a definite number in whom treatment by radium is to be preferred.

When it is considered that out of thirty patients treated (certainly selected cases) only one was sub-

sequently operated on (I have told how this might easily have been a success), that only one required a second dose, and that the remainder have all been cured to date of their outstanding complaint, menorrhagia, while those suffering from fibromyomata all show a decrease in the size of the tumour since treatment, we feel that this is a line of treatment worth further investigation.

It is worth remembering, especially by those who do not favour the use of radium in treating these conditions, that it often proves a good "second string" for patients who refuse a cutting operation or who, because of renal, pulmonary or cardiovascular disease, are bad "surgical risks".

In conclusion, allow me to repeat once more that it is not intended here to represent radium as a "cure-all" in these conditions, but rather as a useful addition to our present armamentarium in the treatment of menorrhagic conditions, for it is not unlikely that the near future will see it employed with much greater effect and benefit than today.

URETERAL ECTOPIA.

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RECENTLY, in the Department of Urology at the Sydney Hospital, we encountered a case of ureteral ectopia, an account of which forms the basis of this paper. We are reporting it in detail, because we regard such a condition as of supreme interest from at least three points of view.

1. As the subsequent history will show, this case, like the few others that have been reported in the medical literature, is of great clinical importance. Without a correct diagnosis and treatment the patient is doomed to a life of misery and discomfort and perhaps social ostracism. The complaint of urinary incontinence, or frequency of micturition, or leakage, comprehensively expressed by the patient as "I can't hold my water", is an ever-recurring problem to every practitioner. Reviewing the literature on cases of ectopic ureter, we found that many had been falsely diagnosed, with a variety of ineffective treatment in consequence; we therefore stress the importance of considering this condition in the differential diagnosis of urinary incontinence.

2. Ureteral ectopia is extremely rare, and we confess to an interest in the rare and unusual in pathology. As a matter of fact, of the particular variety of ureteral ectopia here described, ours is

the first reported in the literature that has been diagnosed during the patient's life. (See Table III in an article by Edward F. Kilbane, *Surgery, Gynecology and Obstetrics*, January, 1926.)

3. The embryological significance of such a case, which we propose to discuss in detail, is of great scientific interest.

Clinical History.

D.R., a female, aged eighteen years, complained that she could not "hold her water" and had been like this all her life. On questioning her we elicited the following facts: She had a lifelong history of urinary leakage. For some years, until she was about eight years of age, she attended the Royal Alexandra Hospital for Children. Since then she had not consulted a medical man until she came to our clinic. She was employed as a salesgirl at a large city department store, but was frightened now that she might "lose her job". The urinary leakage was worse while she was standing (as she was obliged to do all day) and was less at night. She used to soak three pairs of bloomers a day and had to wear water-proofing to keep her frock dry. She wet the bed every night. She used to try to keep herself dry by wearing diapers, but they chafed her, so she gave them up, preferring to let the water soak her bloomers. Apart from this there was no pain—no discomfort of any kind.

A most important and significant detail of the history was this, that apart from the constant leakage the patient had a normal control over her bladder, that is, desire came at appropriate intervals, and the act was completed by passing the usual amount of urine with the usual satisfaction; she was quite sure about this. Nevertheless, with an empty bladder the leakage went on just the same. She did not get up at night to pass urine; the leakage occurred whether there was desire to pass urine or not.

There were no previous illnesses, and she had always enjoyed excellent health except for her present lifelong disability—surely a tragic condition for a young and attractive woman.

The patient was a handsome young woman of slight but good physique. General examination, particularly of the central nervous system, disclosed no abnormality. Local examination disclosed that she was a *virgo intacta*; there was no discharge, no redness, no urinary odour. On separating the labia and swabbing the vulva, moisture would appear every now and then from the region of the urethral orifice, and gradually trickle on to the perineum. The bladder was emptied by catheter (the urine was quite normal) and still the moisture appeared. The bladder was now filled to capacity with a strong solution of indigo-carmin and the patient was given several glasses of water to drink. Clear moisture continued to appear and became more frequent and greater in quantity if the patient strained or sat up. Within some minutes of drinking the water the moisture greatly increased, and finally we observed it escaping in a fine jet from a minute opening just below and slightly to the left of the urethral orifice. Some of this moisture was collected in a test tube; it was clear, like water, and free from any foreign matter. This watery fluid could not have come from the bladder, which was filled with an ink-like solution of indigo-carmin. The presumption was that it came from some other portion of the urinary tract, and we felt that we were dealing with a case of ureteral ectopia.

The patient was given "Uroselectan B" and the usual number of plates were taken. They all had practically the same appearance, and Figure I is an illustration of the findings. It will be noticed that the left kidney shadow is smaller than the right; that the left kidney has well

formed and well filled pelvis, calyces and ureter; the upper margin of the left superior calyx is opposite the transverse process of the second lumbar vertebra. On the right side the kidney shadow is larger and there appears to be two pelves, one above the other. We could not detect two ureters.

It would seem from this examination that we were dealing with a double kidney on the right side with two pelves and two ureters, one of which probably opened outside the bladder. Subsequent examination proved this to be incorrect, but at this stage we wish to stress several points in order properly to understand the difficulties that we later encountered: (i) The left kidney has well-formed pelvis, calyces and ureter. (ii) The left kidney secretes "Uroselectan". (iii) There is no evidence of any reduplication on the left side. (iv) The upper limit of the left superior calyx is opposite the transverse process of the second lumbar vertebra.

We might add in parentheses that all our examinations were made on the same urological table and the plates were taken with the same centring and with the patient in deep inspiration.

At our next examination the patient was given indigo-carmin intravenously and was submitted to cystoscopic examination. The bladder was quite normal, except that the left side of the trigone was somewhat flattened and no ureteral orifice on the left side could be found. A careful search of the whole bladder and bladder neck was carried out (and repeated on several subsequent occasions), but no ureteral orifice could be found on the left side. We thought we detected a swirl of indigo-carmin from the urethra on one occasion, but nevertheless did not find any ureteral opening. The right ureteral orifice was quite normal and excreted dense indigo-carmin in four minutes. It was easily catheterized and a pyelogram of the right kidney was taken after injecting up the catheter a 12.5% solution of sodium iodide. This pyelogram proved that what, after the use of "Uroselectan", we took to be probably a double kidney, was really one large pelvis divided into two portions, one portion draining the upper half of the kidney, the other draining the lower half of the kidney. This could be demonstrated clearly only when the pelvis was filled with opaque solution by injection through a catheter. The excretion of "Uroselectan" from the kidney not distending the pelvis gave the appearance of reduplication.

A very important observation was made at this stage and confirmed on another occasion, namely, that only the faintest quantity of indigo-carmin was excreted from the ectopic opening.

We now attempted the most important examination of all, that is, catheterization of the ectopic opening; but, like other observers in similar cases, we found great difficulty. The smallest ureteric catheter available would not pass up the opening more than one centimetre, nor could we pass a fine metal probe. Finally, we passed into the orifice a curved lachrymal needle attached to a syringe and forced a 12.5% solution of sodium iodide up the canal. The resulting picture is clear and very informative (see Figure III). It shows a dilated tube passing up the left side to a region just below the transverse process of the first lumbar vertebra, where it ends blindly.

Now, if comparison is made with Figure I, it will be seen that this tube runs to some position apparently above the pelvis and calyces of the left kidney, which reached only to the transverse process of the second lumbar vertebra. The ideal procedure would be to fill both this tube and the kidney at the same time, but it will be remembered that we could not find a left ureteral opening in the bladder, and so

were left with the belief that this tortuous tube might be the left ureter opening in the vulva. (Note also that the lower end of the tube is sac-like and tortuous, a condition noted by other observers who have met these cases.)

So far, then, we had proved that the ectopic opening belonged to a tube which ran to the region of the left kidney, where it seemed to end blindly. But it must be remembered that in attempting to fill the pelvis and calyces of a kidney by pressure from the orifice, one often succeeds only in filling the ureter and not the pelvis and calyces at all; we were confronted with this difficulty here. The fact that the apparently blind end seemed to be above the pelvis and calyces, as outlined by "Uroselectan", was not strictly reliable, as it will be remembered that the distance of less than one vertebra separated them. This appearance might be accounted for by a slight difference in centring the patient on the table and by a difference in the degree of inspiration, these pictures being taken at different times.

In our opinion the greatest difficulty arose in realizing that the ectopic opening excreted practically no indigo-carmin, and yet we could get a good picture of the left kidney, pelvis and calyces with "Uroselectan", which would seem to show that the fluid from the ectopic opening came from some other source than that which excreted the "Uroselectan". This argument is based on the assumption that the excretion of "Uroselectan" is a test of kidney function comparable with the excretion of indigo-carmin. Some urologists will deny this, and with good reason, because it is obviously difficult to make an accurate comparison between a shadow cast by a drug on an X ray plate on the one hand, and the amount of coloration produced in urine on the other. A quantitative estimation of the excretion of each drug would be the only possible method, and so far this cannot be put into practice. However, we feel that where the indigo-carmin excretion is poor the "Uro-

selectan" excretion is poor also, and *vice versa*; further than that we do not go.

Reverting to the fact that we could not discover a ureteral opening in the bladder, it does not therefore follow that the ectopic opening is on the vulva. Two possibilities are available: (i) That the opening in the bladder was in some unusual place and so small that we failed to find it. We flatter ourselves that with careful and repeated searching after the administration of indigo-carmin an opening in the bladder was not likely to elude us. (ii) That the ureter opened in the urethra. It is our belief that such is the case, as subsequent events proved.

In conclusion, then, our ectopic opening was one

of two things: (i) the ureteral orifice of a single left kidney, or (ii) the opening of the upper ureter of a double kidney, the other ureteral opening, also ectopic, being probably in the urethra. The balance of evidence favoured the second possibility.

Historical Summary.

In 1926, Kilbane, in a brilliant paper in *Surgery, Gynecology and Obstetrics*, reviewed the literature up to that time. He collected 98 cases and added

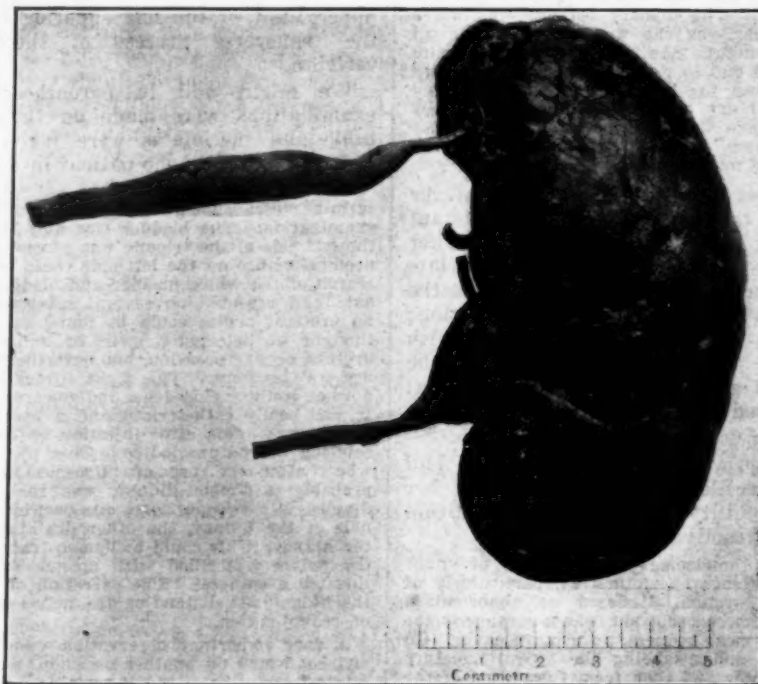


FIGURE III.

two cases of his own.

James C. Sargent (*The Journal of Urology*, March, 1930) further reviewed the literature and brought the total of cases to 180, of which 123 occurred in females and 63 in males.

Winfield and Higgins (*The Journal of Urology*, July, 1932) collected eight additional cases from the literature—seven in females and one in a male—and they described one additional case in a female. This made a total to that date of 64 males and 131 females.

Two more cases (in females) were described in *The British Journal of Urology*, March, 1932, by James McClelland, and we add a further case, bringing the grand total to date to 198 (64 males and 134 females).

ILLUSTRATIONS TO THE ARTICLE BY DR. REGINALD BRIDGE AND DR. WALTER PERRY.



FIGURE I.



FIGURE II.

ILLUSTRATIONS TO THE ARTICLE ON "A PICTUREGRAM SERVICE" APPEARING ON PAGE 633.

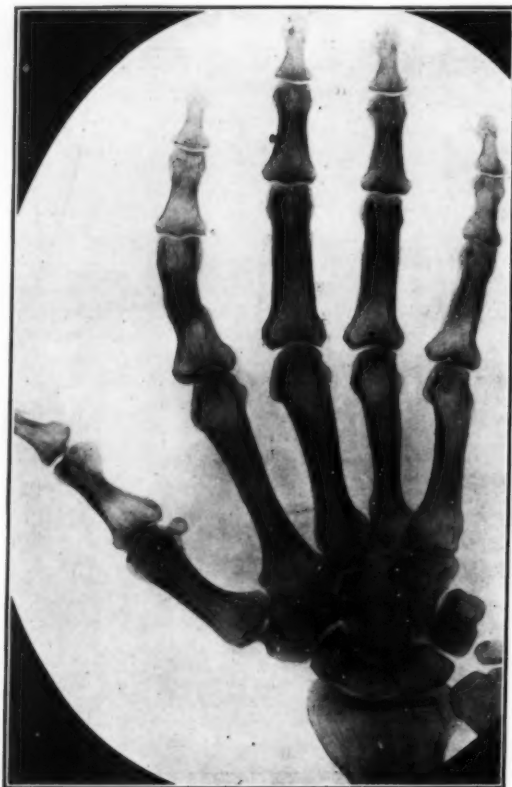


FIGURE I.
Showing original X ray photograph.



FIGURE II.
Showing picturegram copy.

The great preponderance of females is probably more apparent than real. In the female the opening, occurring in a position where the urine can reach the surface, produces obvious symptoms, whereas in the male the opening, occurring in some place behind the external sphincter (*compressor urethrae*), is not likely to lead to urinary leakage. As a matter of fact, practically every case in the male has been detected either at autopsy or as a result of some superadded complication leading to pathological changes in the upper urinary tract. This matter will be explained in detail under the heading "Embryology".

Pathology.

Developmental defects of the genito-urinary organs take a variety of forms, but we are in this paper confining our attention to abnormalities in development of the kidneys and ureter. A clear understanding of the embryology of these organs is essential to a proper appreciation of their pathology. We therefore add as an appendix an account of the development of the urinary organs. Kilbane classifies these cases as follows:

1. Single ureter with ectopic opening: 24 cases.
2. Complete unilateral duplication of pelvis and ureter with an ectopic opening of the supernumerary ureter: 55 cases.
3. Complete unilateral duplication of pelvis and ureter with ectopic opening of both ureters: 2 cases.
4. Supernumerary kidney, pelvis and ureter with an ectopic opening: 2 cases.
5. Bilateral duplication of pelvis and ureters with one ectopic opening only: 14 cases.
6. Bilateral duplication of pelvis and ureters with bilateral ectopic openings: 2 cases.
7. Both single ureters having ectopic opening: 1 case.

Our case comes under heading 3, and, so far as we can make out, is the first case reported in the literature which was diagnosed during life, the two cases reported by Kilbane being from *post mortem* specimens in males.

These ectopic ureters are often dilated and tortuous, and most of them have a sacculatation at the lower end. Infection often supervenes, and then the clinical picture may be dominated by such infection. In a certain proportion of these cases the ectopic opening may be in the urethra and so embraced by the compressor fibres that external leakage cannot occur, the urine running back into the bladder; or maybe the leakage occurs only under stress of excitement. Such cases are detectable only when infection occurs or when there is leakage after child-birth, due to stretching of the parts. This latter possibility had a direct bearing on the treatment adopted in our case. It would be wise to remember the possibility of a ureter opening into the urethra in those cases of incontinence which follow child-birth.

Some twelve years ago I saw a patient who always had a "weak bladder". The condition became worse after child-birth. An attempt had been made to tighten the bladder neck, after which the patient became absolutely incontinent. When the patient came under my care, I found both ureteral orifices opening in the urethra. The patient died of infection and uræmia before further investigation could be carried out.

David M. Davis (*Journal of Urology*, April, 1930) describes a case of a supernumerary ureter opening in the urethra of a female without producing incontinence of urine. The ureter was dilated, tortuous and infected. The case, as may well be imagined, presented a variety of confusing signs and symptoms and called for all the resources of urology in its elucidation.

Symptoms.

The clinical history of our patient, as already given, summarizes the symptoms of an uncomplicated case with the opening completely outside the bladder. A lifelong history of incontinence with, at the same time, a capacity to store urine in the bladder and allow it to escape by a normal act of micturition is very characteristic.

Urological surgery has now made such progress that little children can and should be submitted to the same investigation as adults, and with practically the same ease. It is unscientific and wrong to deny them these aids to exact diagnosis.

It is surprising what a number of diverse lesions trade under the name of enuresis (see an article by Meredith and Campbell, *Journal of Urology*, September, 1932). Ureteral ectopia might very readily explain an enuresis persisting after the child should have control of the bladder.

In the male, for embryological reasons, the ectopic opening is above the *compressor urethrae*, and therefore leakage never occurs. Cases in the male are only detected *post mortem*, at operation, or as a result of some added pathology, such as occlusion of the ectopic ureter with infection. In the female the opening may, as a number of observers have found, open in the urethra, in which case the urine may not escape except at micturition.

Such cases may go undetected; the stretching that occurs at child-birth, which by itself may not be sufficient to allow the bladder urine to escape, may nevertheless allow the ectopic ureter to leak to the surface. A faulty diagnosis could easily occur and ill-advised surgery result. Such ureters are nearly always tortuous and strictured; they naturally are readily infected. The symptoms may then depend entirely on the infection and its complications.

Kilbane gives an exhaustive account of the various symptoms presented by the cases reported in the literature. His article is a classic summary of this matter.

Diagnosis.

We have already described in detail the method we adopted in our case. Every case of urinary leakage or bladder weakness in a female should be suspected, especially if the condition is of lifelong duration or has come on after pregnancy.

It is easy to fill the bladder with a liquid like indigo-carmin and determine whether the leakage is coloured or not. If the leakage is not coloured, obviously the fluid is not coming from the urinary bladder. A careful search with a magnifying glass will detect the opening, and this may be facilitated,

as it was in our case, by making the patient drink large quantities of water and by giving indigo-carmin intravenously.

A word of warning is necessary. If a catheter be passed into the urethra or a vaginal speculum be used, remember that it may press on the ureter as it runs under the mucosa and no leakage will be seen. The details of further investigation will have to depend on the resource of the urologist who undertakes to investigate the case.

A detailed description of such urologic methods would be outside the scope of this paper.

Treatment.

In the female the first aim of treatment is to cure the incontinence. If pathological changes have occurred in the upper part of the urinary tract, then both conditions must receive treatment. As incontinence does not occur in the male, attention is usually drawn to upper urinary tract distress.

It is very important to determine whether the urine from the ectopic opening is infected or not, because in the presence of infection, certain conservative operations are contraindicated. It is also important to determine if the portion of kidney drained by the ectopic ureter possesses any function, for again in the absence of function, or in the case of poor function, certain conservative operations are contraindicated.

Our prime aim, then, is to cure the incontinence with the conservation of as much healthy renal tissue as possible.

A careful study of each case is necessary in order to arrive at the best possible procedure. In a general way treatment may be directed to some operation on the lower part of the urinary tract, such as ligation or implantation of the ureter into the bladder, or to an operation on the upper part of the urinary tract, such as nephrectomy, heminephrectomy, ligation of the ureter, anastomosis of one pelvis to the other, or ureteral anastomosis. Ligation of the vaginal end of the ureter is unsatisfactory, since recurrence frequently occurs, and, as is usual with ligation, is apt to lead to a stormy convalescence. This operation is definitely contraindicated in the presence of infection.

In the case of a supernumerary ureter draining one pelvis of a double kidney, ligation may lead to a stormy convalescence and may destroy the healthy remaining portion of the kidney.

In the absence of infection in the case of a single kidney and ureter, provided the function is good, implantation by the suprapubic route is the method of choice. In the presence of obvious infection or kidney drainage with poor function nephrectomy should be done. Implantation generally seems to be satisfactory as far as curing the incontinence is concerned, but it must be remembered that nearly all operative results are recorded with one end in view, that of establishing a cure of the incontinence. Very few statistical results are available to show what the remote result of the operation was. Some of the implanted ureters eventually became stenosed

with destruction of the kidney, and eventually nephrectomy was performed. In some a late infection occurred, leading to an intractable cystitis, cured only by removing the infected kidney. Even a mildly infected urine from the kidney may lead to an intractable cystitis, leaving the patient with symptoms worse than she had before.

Ingenious methods have been devised of implanting the lower end of the ureter into the bladder by the vaginal route, or of cutting an opening through the bladder base into the ureter and so forming a vesico-ureteral fistula. In very suitable cases a few of these methods have been successful, but stenosis and infection again have caused trouble, as in suprapubic implantation into the bladder. One operator cured the ureteral incontinence by such an operation, but so damaged the urethra that the patient afterwards had true vesical incontinence.

As we have pointed out, the majority of these ectopic ureters come from a supernumerary pelvis, and, taking all things into consideration, removal of the affected portion of kidney (heminephrectomy) is the operation of choice. This operation, when conditions are suitable, is perfectly feasible, and has been performed a number of times.

With excretion and retrograde pyelography we can gather most accurate information as to the anatomical and pathological state of the kidney. Unfortunately we cannot, without exploration, determine the distribution of the blood supply. If the blood supply is wholly to the normal portion or evenly distributed, heminephrectomy is possible. When the blood supply runs wholly into that portion which is pathological, heminephrectomy is impossible. Our choice then lies between nephrectomy and anastomosis between the two pelves or the two ureters. Owing to the disparity in size between the normal and diseased ureter, the presence of infection, and for other technical reasons, such an undertaking is rarely feasible.

Operation.

In our case we decided to explore the kidney.

The kidney was exposed by the usual left lumbar incision. No difficulty was experienced in freeing and delivering the lower pole. The kidney appeared smaller than normal. We then found that there were two ureters: The lower, which was quite normal, came from a normal pelvis; the upper, which was the one opening on the vulva, was dilated and tortuous, and ran to the upper pole of the kidney, where its termination could not be seen. We could not free and deliver the upper pole. The whole vascular pedicle, which was short, ran to the upper pole and prevented delivery.

As every surgeon knows, despite the most gentle handling of the kidney, extravasation of blood under the capsule is apt to occur. In our case this most effectively obscured the line of demarcation between the two portions of kidney, each carrying its separate ureter. The upper portion was about the size of a filbert nut (this was determined only after removal of the kidney and stripping the capsule) (see Figure IV). Partial nephrectomy now seemed out of the question, and as we knew that the other ureter was also ectopic, probably opening in the urethra, we decided on nephrectomy. This was easily accomplished. The patient made an uneventful recovery and, we may add, is highly pleased with herself.

The specimen (Figure III) was prepared under the supervision of Dr. Keith Inglis, who kindly cut a section for us.

After stripping the capsule and removing the fatty and areolar tissues from the hilar region, it was seen that on the upper pole of the kidney there was a discrete small mass of kidney tissue about the size of a filbert nut. This is not detachable from

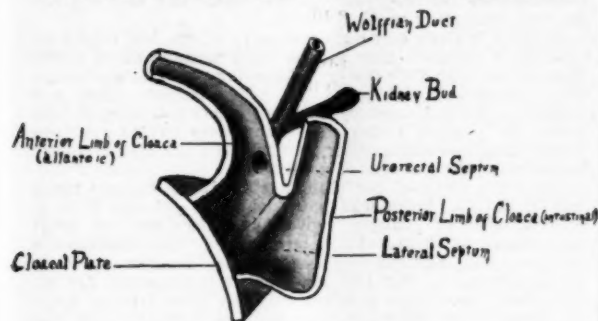


FIGURE IV.
Showing diagram of cloaca.

the main mass. There is merely an indentation of the kidney with some fibrous tissue between to denote the separation of the upper portion from the lower. The lower portion of the kidney retained its foetal lobulation. The main blood supply ran into the hilum at the upper end, close to the small upper mass; the dilated upper ureter ran into the hilum at its upper end and disappeared without ending in a pelvis. Let us say it was impossible to determine these things at operation, in case it might be suggested that a removal of the upper mass would have sufficed. In any case, any attempt at dissection *in situ* would have involved grave risk of injury to the short renal vein which was clearly seen preventing delivery of the upper pole; such an accident would have been a calamity. And, finally, we knew that the ureter from the lower portion was ectopic also, and so we think that both for the present and future welfare of the patient, nephrectomy was the best procedure.

A microscopic section of the supernumerary upper portion showed it to consist of kidney tissue. There was no evidence that it consisted of persistent mesonephros.

Embryology.

The kidney, ureter and trigone of the bladder arise from a portion of the intermediate cell mass known as the nephrogenic cord, which extends from the head to the tail of the early embryo.

The pronephros appears in the cephalic end of this mass as a series of transverse parallel tubes. One end of these tubes opens into the body cavity, receiving an invaginated branch of the aorta as a glomerulus. The other bends backwards, joining with its fellow behind to form a longitudinal duct, which gains entrance into the cloaca. The parallel tubes soon disappear (in fact, the cephalic ones have atrophied before the caudal ones have

appeared), leaving only the duct opening into the cloaca. This duct is the Wolffian duct, gaining its name from the fact that it acts as the duct of the next structure to arise in the nephrogenic cord (Figure IV).

The Wolffian body consists of a series of convoluted tubes whose inner ends are shut off from coelom but are invaginated by a glomerulus, and whose outer ends open into the Wolffian duct. It reaches its zenith at the second month and is then seen as a comparatively enormous structure attached to the posterior wall of the foetal coelom and occupying the major portion of that cavity.

At the fifth month this structure in its turn has disappeared entirely, with the exception of a few of its tubules, which form accessory parts of the genital apparatus (see Figures V and VI).

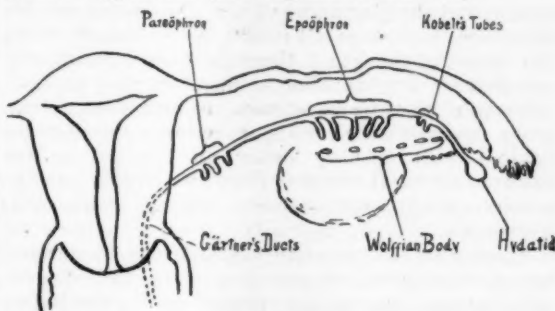


FIGURE V.
Showing diagram of the embryonic vestiges contained in the broad ligament.

The metanephros or permanent kidney first appears as a budding from the dorsal surface of the lower end of the Wolffian duct, a short distance above the point of entrance of the latter structure into the cloaca, which by this time is being shut off from the gut by a septum (see Figure IV). As the ureteral bud grows upwards, it becomes capped

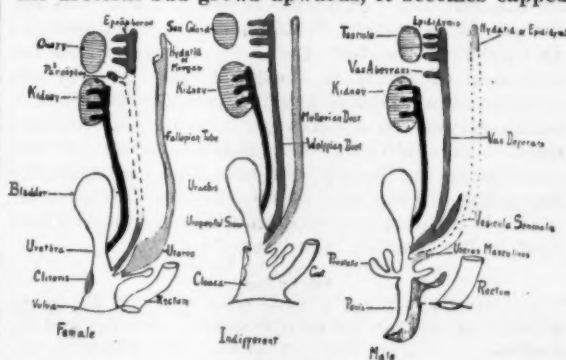


FIGURE VI.
Showing diagram of transformation of the Müllerian and Wolffian ducts.

by a portion of the still undifferentiated nephrogenic tissue lying caudal to the Wolffian body. The ureteral bud divides into two at its distal extremity, the nephrogenic tissue cap dividing also and forming a cap for each division. These in their turn divide, taking caps with them, this process proceeding until

the completed metanephros has been formed. The nephrogenic tissue is responsible for the secreting apparatus, whilst the bud from the Wolffian duct forms the collecting tubules, minor and major calyces, pelvis of kidney and ureter. Whilst the changes are taking place in the ureteral bud, the portion of the Wolffian duct below the bud is being taken up into the anterior portion of the cloaca, which has now been cut off from the above mentioned septum (see Figure IV). This portion of the Wolffian duct forms the trigone of the bladder with its ureteral openings at its angles posteriorly and the anterior portion forming in the female (see Figure V) the whole urethra, and in the male the posterior urethra as far as the ejaculatory ducts. The portion of the Wolffian duct above the ureteral bud forms in the male the *vas deferens*, seminal vesicle and the ejaculatory duct. In the female this structure, known as Gärtner's duct, runs between the layers of the broad ligament from immediately below the ovary, parallel to the Fallopian tube, to the side of the uterus, whence it turns down to run along lateral to the cervix, thence into the anterior vaginal wall opening below and lateral to the external urethral meatus; but it may open into the uterine cervix or anterior vaginal wall (see Figure V).

There are two possible explanations to account for the occurrence of ectopic ureters, and also for the fact that the ectopic ureter drains the higher kidney pelvis. The first hypothesis assumes that the Wolffian duct gives off two ureteral buds instead of one, the upper ureter, carried down as the lower portion of the Wolffian duct, is being absorbed into the cloaca, to form the trigone, thus explaining the fact that of double ureters the one belonging to the upper kidney opens below the ureter corresponding to the lower kidney. The alternative explanation assumes that the upper structure is not a kidney at all, but the persistent Wolffian body, and the ureter the persistent Wolffian duct. In support of this view is the fact that ectopic ureters so far described occurring in the male open into the *vas deferens*, seminal vesicle or ejaculatory duct, all of which structures are really parts of the Wolffian duct. In addition, the ectopic ureters so far reported in the female have been found to open just below the urethra or into the anterior vaginal wall, which is the position of Gärtner's duct (the Wolffian duct in the female) (see Figure VI).

Addendum.

Since this paper was written there has occurred in the practice of one of us (R.B.) another case of ureteral ectopia.

The clinical history of this case summarizes in a striking fashion a great deal that has already been described in our paper. It will be seen that this young woman has had a lifelong history of urinary incontinence with its attendant social and physical misery.

B.H., a female, aged twenty-eight years, had been married ten years and had one child, aged eight years. She consulted one of us (R.B.) on account of right-sided abdominal pain. She did so on account of a fear that there was "something wrong with her right kidney". She knew that there had been severe kidney trouble on the

left side some years before. In addition, she complained of "inability to hold her water more or less all her life". The following details were obtained:

At fifteen months of age she was operated upon for intussusception. From her earliest infancy she used to wet herself. She used to soak three or four pairs of bloomers a day, but as commonly happens in some of these cases, as we have pointed out, she was dry at night. She naturally suffered a great deal of chafing from the constant moisture of her underclothing, and was frequently punished for her apparent carelessness. She had a great deal of unavailing medical advice.

Between sixteen and eighteen years of age her condition seemed to improve, that is, she used to have short spells of three or four days during which she was relatively dry. She married at eighteen years. Two months after her marriage she had a severe infection in her left kidney (she called it "pyelitis") and was desperately ill for fourteen weeks (her medical adviser confirmed this). Her recovery began after the passage of a calculus.

After the birth of her child her condition became much worse, that is, there was more leakage, and she used to have attacks of cystitis. (We have discussed the great importance of child-birth in our paper.) She consulted a surgeon, who advised an operation to "tighten the neck of the bladder". Her life has been very miserable for the last eight years, her greatest freedom from trouble being no longer than three to four days at a time. She had come to regard her trouble as a congenital peculiarity, and therefore inevitable.

For the last eighteen months she has had at odd times attacks of pain in the right iliac fossa, and this fact led her to seek advice, as she feared trouble in her right kidney.

Examination leaves little doubt that her right-sided pain is appendiceal in origin.

This patient was submitted to the routine urological examination as set out in our paper.

In the consulting room (at which time her leakage was very severe) the following observation was made. The bladder was emptied by catheter and then filled in with a strong solution of indigo-carmin, a pad was applied to the vulva, and the patient was allowed to walk about. At the end of five minutes the pad was distinctly moist, but there was no escape of the blue solution. Close visual inspection of the vulva and vagina could not detect any leakage. An X ray picture of the urinary tract disclosed a stone about the size of a marble in the left kidney.

The patient was sent to hospital.

Cystoscopy revealed a normal right kidney and ureter. No ureteric orifice could be detected on the left side.

However, in contrast to our first case, the opening was found in the urethra slightly to the left of the middle line, and the ureter was catheterized. A large catheter passed easily to the left kidney. The urine which escaped was turbid, of low specific gravity, and contained only the faintest trace of indigo-carmin. A pyelogram showed a small pelvis and small calyces; the lower calyx was greatly dilated and contained a large calculus.

Without labouring the discussion, we decided that nephrectomy was the best method of treatment. This was carried out and a congenitally small kidney containing a calculus was removed. The patient made an uneventful recovery.

BIOCHEMISTRY IN RELATION TO ANÆSTHESIA.¹

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THE twentieth century has witnessed extraordinary developments in the technique of biochemistry. Refinements in analysis undreamed

¹ Read at a meeting of the Section of Anæsthesia of the Victorian Branch of the British Medical Association.

of thirty years ago have enabled the research worker to disclose the nature of cellular changes previously vaguely described as vital. In the realm of anaesthesia a flood of light has been thrown on many previously unexplained problems, and in the following pages some of these discoveries are briefly discussed.

Chemical Changes in the Heart During Anaesthesia.

The work of A. V. Hill, Hopkins, Meyerhof and others has demonstrated that contraction of muscle is normally an anaerobic phenomenon. Although oxygen is not needed for muscular contraction, it is necessary for the restoration of the muscle during the recovery phase. The view accepted by most physiologists is that during the anaerobic contractile phase glycogen in the muscle fibres is changed first to hexose phosphoric acid (lactacidogen) and this is further converted to lactic acid and phosphoric acid. During the recovery phase four-fifths of the lactic acid is restored to glycogen and the energy necessary for this synthetic process is obtained by the combustion of the remaining one-fifth of lactic acid. For this combustion oxygen is necessary. These relationships are illustrated in Figure I.

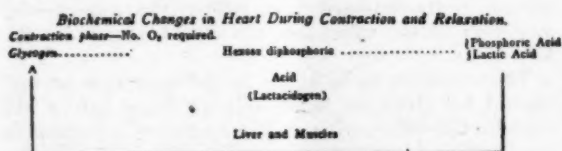


FIGURE I.

As the hydrogen ion concentration of muscle increases, the speed of oxidation and recovery decreases. This is more marked in cardiac muscle than in skeletal muscle and should the hydrogen ion concentration become excessive, cardiac irregularities and failure may occur. It must be remembered also that the buffers of heart muscle are not as efficient as those of skeletal muscle. According to Schenck, chloroform causes a marked decrease in glycogen and an increase in lactacidogen and lactic acid in heart muscle. It probably acts in a similar manner to cyanide in inhibiting the mechanism for the removal of lactic acid. Ether and nitrous oxide have a less intense effect in causing glycogen depletion and acid accumulation. Another compound in muscle which is of great biochemical interest is phosphagen. When muscle is stimulated anaerobically, phosphagen is broken down into its constituents, creatine and phosphate. The phosphate which is derived from phosphagen anaerobically does not remain as such in the muscle, but probably unites temporarily with hexose to form hexose diphosphate. In the presence of oxygen the phosphate is liberated from the hexose and reunites with creatine to form phosphagen. At the commencement of stimulation the amount of phosphoric acid derived from phosphagen may be three times as great as the lactic

acid formed from glycogen, but the ratio is subject to considerable variation. In extreme fatigue, while lactic acid formation continues, phosphagen disintegration may stop almost completely. Phosphagen may be an essential component of the mechanism of muscular contraction, but its exact rôle is as yet not fully understood.

In *diabetes mellitus* and in toxic goitre there is usually great depletion of the carbohydrate stores in the body and a low glycogen content of heart muscle. Before administering an anaesthetic to patients suffering from either of these maladies, it is wise to increase the carbohydrate stores by suitable dietetic measures and the administration of insulin in diabetes or by the use of iodine to lower the metabolic rate in toxic goitre. It is probable that some of the tragedies of sudden cardiac failure during anaesthesia are due to low glycogen content of the heart muscle. The old method of prolonged starvation before operation aggravated such tendencies, whereas the modern use of glucose pre- and post-operatively insures an optimum storage of glycogen in the liver and also in the heart.

Adrenaline and Ventricular Fibrillation.

Goodman Levy demonstrated that the injection of adrenaline into a cat anaesthetized with chloroform might cause ventricular fibrillation and death. It is not sufficiently well recognized that a similar catastrophe may follow this unhappy combination of drugs in the human subject. The use of adrenaline prior to chloroform anaesthesia is not fraught with such danger as its injection during anaesthesia, but nevertheless is to be avoided whenever possible. Many sudden deaths following the commencement of a surgical procedure whilst the patient is still under light chloroform anaesthesia are no doubt due to the surgical stimulus causing the liberation of adrenaline from the suprarenal glands with the subsequent development of ventricular fibrillation.

Another fact of interest is that evidence has accumulated to show that the vagus nerve, when stimulated, causes to be liberated in the heart a chemical substance, probably acetyl choline, which is the agent responsible for the inhibitory action of this nerve. This acetyl-choline-like substance is intensely active and very unstable, and on hydrolysis yields choline which is much less potent.

Biochemical Changes in the Blood.

Of the many changes which occur in the blood during anaesthesia, two will be briefly considered: the alkali reserve and the blood sugar.

The Alkali Reserve.

Acidosis, which frequently follows the administration of a general anaesthetic, is associated with a lowering of the alkali reserve of the body. The causes of acidosis are: (i) excessive formation of aceto-acetic acid and β -hydroxy-butyric acid, (ii) the retention of phosphoric acid due to renal inefficiency, (iii) failure to excrete carbon dioxide.

1. In considering the first group it is essential to remember that the oxidation of an adequate amount of carbohydrate seems necessary in order that normal fat metabolism may occur. If the carbohydrate is poorly oxidized, as in diabetes, or is absorbed from the bowel in inadequate amounts, as in diarrhoea, cyclical vomiting of children or pernicious vomiting of pregnancy, then the fat fails to be oxidized to its normal end products of carbon dioxide and water. Instead, aceto-acetic acid (diacetic acid) and β -hydroxy-butyric acid are formed, and these, together with acetone, which is produced by decomposition of aceto-acetic acid, are called the "acetone bodies". The formation of aceto-acetic acid and β -hydroxy-butyric acid probably occurs normally in the oxidation of butyric and other fatty acids derived chiefly from fats, but in part from amino-acids. In diabetes and the other conditions just referred to they are excreted as such instead of being completely oxidized. In these circumstances the acetone bodies appear in the urine and are associated with an excess of phosphoric acid and ammonia. The blood may show a diminution of plasma bicarbonate, and owing to increased pulmonary ventilation (hyperpnoea) the carbon dioxide in the alveolar air is reduced. Even in a condition of most severe acidosis there is but slight alteration in the hydrogen ion concentration of the blood, which is normally pH 7.3 to 7.5. Very small deviations from the normal may cause death, hence there is in the blood provision against any marked change in reaction.

While both the lungs and kidneys are concerned with the regulation of the reaction of the blood, the special chemical factors involved may be summarized as: (a) bicarbonates of the blood, (b) phosphates of the blood, (c) ammonia formation, (d) proteins of the plasma, (e) changes of base associated with haemoglobin and oxyhaemoglobin equilibrium, (f) transfer of chloride to blood corpuscles (Hamburger phenomenon), (g) bases derived from bone.

2. In those cases exhibiting renal inefficiency associated with phosphoric acid retention, there is usually no ketosis and a relatively low ammonia content of the urine, but otherwise the biochemical findings in regard to alkali reserve of the blood and carbon dioxide content of the alveolar air are similar to those in Group 1. The low ammonia output may be due to damage of the renal tissue as, according to Benedict, the kidneys are the site of formation of ammonia.

3. Retention of carbon dioxide may occur in uncompensated cardiac disease or in pulmonary conditions in which the ventilation is inefficient, such as is found in pathological states of the pulmonary alveoli. In some such cases a retention of alkali may occur in an attempt to combat the acidosis.

As an illustration of diminution of alkali reserve during anaesthesia the following case may be cited.

The patient suffered from *diabetes mellitus* and *cholecystitis*. He was subjected to *cholecystectomy* under ether

anaesthesia. The pH of the blood before operation was 7.36 and three hours after operation it was 7.18, the carbon dioxide combining power of the plasma having meanwhile dropped from 56.2 to 32.1.

Undoubtedly impairment of liver function, which is so prone to occur during chloroform anaesthesia, is an important factor in the development of acidosis and post-operative vomiting. Nitrous oxide and ethylene produce minimal hepatic disturbance and little tendency to acidosis. All patients about to undergo anaesthesia should be given carbohydrate in the form of glucose or barley sugar until two hours before operation, and if the patient suffer from diabetes or be the subject of acidosis, thirty units of insulin buffered by sixty grammes of glucose should be administered one hour before the operation commences.

The Blood Sugar.

A marked rise in the sugar content of the blood appears to be the usual accompaniment of general anaesthesia. If ether be used, the rate and extent of the rise during the first hour is very similar to that consequent on giving fifty grammes of glucose by mouth to the normal person, but the return to normal is considerably slower. Investigation has shown that a small dose of insulin, such as ten units injected just before the anaesthesia, has very little effect on the blood sugar in the first hour.

Thus, insulin, to be of use in the induction period, should be given at least half an hour before the anaesthetic. The value of pre-operative injection in controlling blood sugar is well illustrated in the following case of diabetic gangrene, in which the patient was subjected to amputation of the leg.

Three hours before operation the blood sugar was 0.270%, and thirty units of insulin were injected; two hours later it was 0.129%. At the beginning of anaesthesia the percentage was 0.102% and at the conclusion of operation 0.100%.

Adrenaline so frequently employed in surgery produces hyperglycaemia, as does also an injection of pituitrin. It must be realized that in administering insulin pre-operatively to a diabetic patient it is desirable that laboratory facilities be available for frequent blood sugar estimations. If such analyses are unobtainable, then insulin should be buffered by the simultaneous administration of glucose. One unit of insulin is responsible for the combustion of approximately two grammes of glucose, so that if thirty units of insulin are injected, sixty grammes of glucose should be taken orally.

Despite the fact that glucose enemata are frequently administered, there is considerable evidence, both clinical and experimental, that glucose is very poorly absorbed from the colon. Levi found that fifty to eighty grammes of glucose administered *per rectum* in saline solution to normal fasting men caused a mean rise of blood sugar of 0.008%, whereas the same quantity of glucose when given by mouth produced a mean rise of 0.085%, that is, an increase more than ten times as great as when the sugar was given rectally. The writer, in collaboration with Miss Splatt at the Melbourne Hospital,

obtained figures which support the contention of poor absorption of glucose from the colon. Levi states that in shock glucose added to rectally administered saline solution may be actually harmful, as by its osmotic action it may delay the absorption of saline solution. McNealy and Willems have brought laboratory evidence to vindicate the clinical work just cited. Using dogs with sodium barbital hypnosis and ether anaesthesia they opened the abdomen and (a) isolated the entire colon by ligatures placed round the ileo-colic junction and recto-sigmoid junction, (b) isolated a loop of distal ileum. Glass cannulae were inserted into each loop and the contents were washed out with warm saline solution. Blood from veins draining each of these

or no nutritional value. It seems that when a patient is in need of glucose, it is desirable to give it orally, or, if he is vomiting, then it may be administered intravenously as a 5%, 10% or 20% solution.

Hypnotics.

The development of synthetic drugs has been dependent for the most part on the recognition of the relationship between chemical constitution and physiological activity. Once the organic chemist has revealed the structure of a molecule and its physiological action, he may, by varying the attached groups of the parent molecule, so alter its constitution as to obtain other desirable physiological qualities.

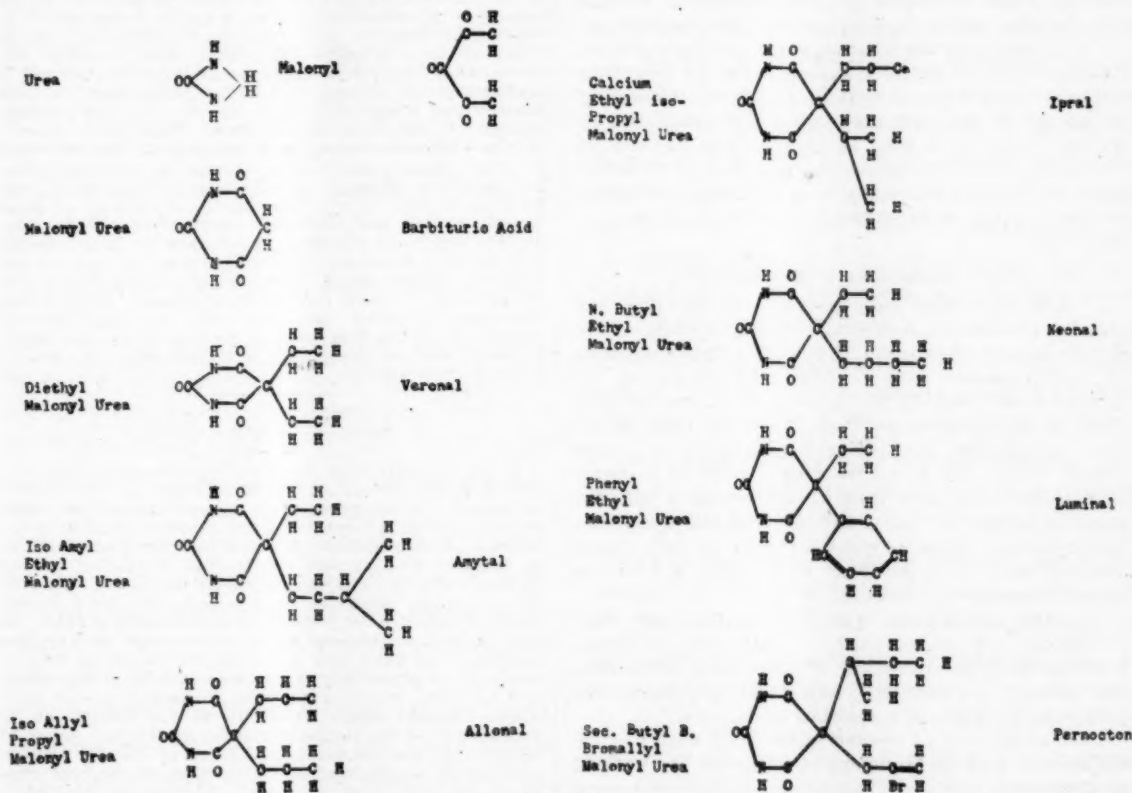


FIGURE II.
Formulae of Various Hypnotics.

loops was taken and the percentage of sugar was estimated. Analyses were again made twenty minutes and forty minutes after introducing 5% glucose into each of these loops. The rise of blood sugar in the vein from the ileum following the introduction of the glucose into this piece of bowel was ninety milligrammes *per centum*, whilst in the blood from the colon no rise occurred. From these and other experiments the conclusion of these investigators was that any absorption of glucose from an enema must be the result of regurgitation through the ileo-caecal valve, and this will be only slight in amount, and that a 5% glucose enema is of little

The depressing effect of hypnotics on the nervous system is most marked on the cerebrum, less on the spinal cord and least on the vital centres of the medulla. The ideal hypnotic, then, has its maximum action on the cerebrum, and the minimum effect on respiration, circulation and metabolism. Hypnotics are neither markedly basic nor acidic and they are moderately resistant to oxidation and hydrolysis *in vivo*. The hydrocarbon group gives lipid solubility to the molecule. Alteration of the spatial arrangements of the existing atoms and groups modifies the physico-chemical properties of the compound and its pharmacological activity. The formulae for

several of the well-known hypnotics, many of which are used for inducing basal narcosis, are illustrated in Figure II.

The introduction of chlorine or bromine usually increases the effectiveness of the hypnotic. Fluorine and iodine have no such influence. Hypnotic action is intensified within limits by increasing the length of the carbon chain and at the same time the surface tension of the compound in solution is decreased. No complete correlation exists between lowering of surface tension and hypnotic action.

If one of the ethyl groups of barbital is replaced by amyl, an increased sedative effect is obtained, and there is a wider margin between the effective and lethal dose. An amyl-ethyl combination is more effective than a propyl-butyl combination, though both contain seven carbon atoms. Replacement of one ethyl group by an alcohol, ether or ketone causes a marked loss of activity, whereas the introduction of benzyl may have a convulsive effect. Changing the atoms in the ring may cause the compound to become toxic or it may be inert. The method of evaluating the hypnotic action of a drug is to determine the amount necessary to cause sleep or abolish certain reflexes in laboratory animals, such as rats and dogs.

Other Applications of Biochemistry.

1. Accompanying enlargements of the prostate gland a rise in blood urea frequently occurs. It is the consensus of opinion that if the figure exceeds 50 milligrammes *per centum*, the operation of prostatectomy should be performed in two stages. First a suprapubic cystotomy is performed under local anaesthesia and suitable drainage is established. When the blood urea has fallen to a figure compatible with safe radical procedure, a general anaesthetic may be administered and the operation is completed. Thus in genito-urinary surgery blood analysis may be a guide as to whether a local or general anaesthetic is desirable.

2. After abdominal operations pulmonary complications are unfortunately only too common. Leaving aside the question of pulmonary embolism, the course of events leading to post-operative bronchopneumonia is somewhat as follows.

Pain at the site of operation, coupled with gastric distension, and the abnormal posture of the patient tend to cause diminished excursion of the diaphragm and hence hypoventilation of the lungs. This leads to stagnation of secretions, atelectasis and finally infection of the collapsed areas.

Stimulation of the respiratory centre by the inhalation of 5% or 10% carbon dioxide in the form of "Carbogen" tends to dispel this atelectasis and prevents the autogenous infection which might occur in such collapsed areas. "Carbogen" may be administered for ten minutes every two hours for the first two days after abdominal operations.

Conclusion.

In conclusion, it must be emphasized that the chemical activities occurring in one organ may have a profound influence on the physiological processes

in other regions of the body, so it would seem that a study of the elementary biochemical changes which occur in the tissues of a patient during anaesthesia would prove invaluable to the practising anaesthetist.

Reviews.

A BOOK ON OBSTETRICS FOR NURSES.

THE ninth edition of Jellett's "Midwifery for Nurses" has been thoroughly revised.¹ The main alterations are noted in the sections dealing with antenatal care, the prevention of puerperal sepsis and the care of the infant. These constitute a decided improvement on previous editions of this classical text book. The chapter dealing with antenatal supervision is adequate and full recognition is given to the value of palpation of the anterior shoulder during labour—a procedure which we owe to Professor J. C. Windeyer. There is still a tendency to advocate uterine douching to a greater extent than most teachers now recommend. Exception may also be taken to the use of anaesthetics by nurses, despite its employment in New Zealand and elsewhere. Objection may also be expressed to early rising in the puerperium. The stated dose of quinine—fifteen grains—may be a misprint, otherwise it is far too large for use in the medicinal induction of labour and repetition of such amounts would be likely to cause harmful results. The section on the prevention of sepsis is well written and accurately summarizes modern views on this important problem. The chapter on infant feeding is apparently based on the official system in vogue in New Zealand. Nurses would do well to check this section with the teachings of their own training schools. Despite these criticisms of detail this text book still maintains its reputation as the best treatise for nurses in the English language and can thoroughly be recommended to those for whom it was written.

MUSCLE REEDUCATION.

IN an excellent little work entitled "The Adjustment of Muscular Habits" J. K. McConnel aims at describing a technique for the reeducation of patients which can be readily applied through the usual channels without special courses of instruction.² Many of the ideas set forth are at variance with current beliefs, and the author indulges in whole-hearted criticism of present methods of teaching. He is always constructive, however, and puts forward many substitutes for present methods which furnish food for thought. Wherever he is at variance with current teaching one finds that his ideas are based on research work in the physiology of the neuro-muscular mechanism, and he freely quotes authorities in support of his views. These remarks apply especially to the section on the reeducation of the intrinsic muscles of the foot where the author criticizes the anatomical teaching that the proximal attachment of the long muscles acting on the foot represents the only fixed anchorage, whereas he proceeds to show that in walking the distal attachments of these muscles are necessarily fixed in order to produce stability. Some very interesting chapters are devoted to the rôle of the intrinsic muscles in producing this fixation. The work as a whole forms a very interesting review of the advances in our practical knowledge of the physiology of muscles and is commended to the careful attention of those whose work brings them in contact with problems of this nature. The book is well printed, the illustrations are excellent, and a careful scrutiny failed to discover any typographical errors. The section on habit formation and its control should be read by all.

¹ "A Short Practice of Midwifery for Nurses", by H. Jellett, B.A., M.D., F.R.C.P.I.; Ninth Edition; 1933. London: J. and A. Churchill. Crown 8vo., pp. 519, with seven plates and 183 illustrations in the text.

² "The Adjustment of Muscular Habits", by J. K. McConnel, with foreword by W. E. Le Gros Clark; 1933. London: H. K. Lewis and Company, Limited. Crown 8vo., pp. 141, with illustrations. Price: 4s. 6d. net.

The Medical Journal of Australia

SATURDAY, NOVEMBER 4, 1933.

All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

Reference to articles and books should be carefully checked. In a reference the following information should be given without abbreviation: Initials of author, surname of author, full title of article, name of journal, volume, full date (month, day and year), number of the first page of the article. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors who are not accustomed to preparing drawings or photographic prints for reproduction, are invited to seek the advice of the Editor.

PRE-ANÆSTHETIC TREATMENT.

The general application of newer knowledge to the practice of medicine is often a lengthy business. Everyone knows that the epoch-making discoveries in medicine have been, as it were, forced upon practitioners. The opposition of the old school is stubborn, and men's minds are not naturally receptive of what entails a complete reversal of accepted doctrine and practice. Eventually right triumphs, but unnecessary suffering has often to be endured in the interval. The history of surgery shows this to be true. Listerism was resisted with a bitterness that in these days passes comprehension. Conservatism has characterized most surgeons since the carbolic spray was introduced, as it did before that time; and a wise conservatism is healthy and good. With this natural conservatism there goes a strange tendency to exploit a new method unduly once it has been accepted. The so-called indications for its use are extended until the method falls into disfavour. The tendency to be content with what is old in surgery and to be blind to its deficiencies, as well as the tendency to work new methods threadbare, must be combated for the patients' sake and for that of the art of surgery. Contentment with old methods

is seen not infrequently in regard to anaesthesia. Years ago, when ether and chloroform were introduced as general anaesthetic agents, it was usual for the patient to vomit while he was recovering. Often the vomiting was excessive, and sometimes it was a menace to the patient's well-being. Vomiting was accepted as usual. Many still accept it as usual, in spite of all that has been discovered about its causation, its prevention and its alleviation. For these reasons the whole question of pre-operative treatment is one that should be considered.

The principles which should act as a guide in pre-anaesthetic treatment have been admirably set out by Dr. E. R. Flint in a Hunterian lecture delivered before the Royal College of Surgeons of England.¹ Those who have access to this paper should read it carefully; in the present instance it will be possible merely to call attention to its main features. Dr. Flint discusses the subject under the two main headings of poor resistance and the acid-base balance. Poor resistance is considered under the subdivisions of dehydration, anaemia, toxæmia, the kidneys and anaesthesia. It is to the kidneys and anaesthesia that we would draw particular attention. A satisfactory renal function will often determine the success of a surgical operation. The renal function is always determined as a routine measure before operation on the urinary tract. Obviously a similar investigation will be of the utmost importance in operations on other systems. Dr. Flint states that when water and sugar used in the preparation of patients for operation fail to cause diuresis or to reduce the blood urea to a reasonable level, and quickly, the threat of so-called uræmia in the event of an operation is a very real one. Anaesthesia is known to be one of the factors liable to cause circulatory failure and acid-base upset. Some interesting results of an investigation into this subject were published in this journal by T. A'B. Travers and E. M. Burt, of the Baker Institute, Melbourne, in November, 1929. Dr. Flint is convinced that the safety of patients lies more with improvements in pre-operative measures framed to overcome or prevent physico-chemical disturbances than in actual operative technique. In some clinics it is usual to give glucose with or

¹ The Lancet, June 3, 1933.

without insulin to patients before operation. Whether this is necessary as a routine measure may be debatable, but it is certain that glucose given before operation will practically eliminate post-anæsthetic vomiting. In this regard the paper in this issue by Dr. Ivan Maxwell should be studied.

Surgery according to some people has reached its zenith. They argue that almost every region of the body has been made accessible to the scalpel and that surgeons have dared to venture so far that little further advance can be expected. This may or may not be true. It is probably not true. What surgeons must do is not to look for new marvels of technique or new spheres of operation until they have perfected what they already have. Medical practitioners always need to remember that the patient is a human being of like temperament, feelings and susceptibilities with themselves. Surgeons, since they inflict injury to eradicate disease, are doubly faced with the necessity. It is amusing to hear a surgeon who has been subjected to his own pet operation complain that he suffered excessive pain or felt undue discomfort because he was more susceptible to pain or discomfort than the average type of patient. For such a surgeon the experience is salutary; for his subsequent patients it is a godsend. The surgeon must regard every unexpected case of post-operative uræmia and every severe bout of post-anæsthetic vomiting not due to the patient's lesion as a failure that must be laid at his door.

Current Comment.

UTERINE ACTION.

MUCH of the recent work done on the endocrines centres round the hormones of the anterior portion of the pituitary body and those of the ovary. The clinical application of knowledge is not always readily made, and much of the information laboriously gained in this field remains of academic interest. Therefore it is important to go over the ground and determine just how the practical problems of medicine can be helped to a solution. The more common and familiar a phenomenon, the more obscure its explanation—this might be claimed with some justice as a true aphorism in clinical medicine. Take the instance of uterine action. What determines the onset of those remarkable series of rhythmic contractions of

uterine muscle in labour? What unites the readiness and fitness of the fœtus to leave the uterus with the capacity of the maternal organs and tissues to perform the necessary dramatic acts?

W. Blair-Bell, M. M. Dainow, and T. N. A. Jeffcoate contribute a comprehensive experimental and philosophical study of the problems involved in uterine action.¹ They point out that uterine action, normal and abnormal, includes a wide variety of functional performance; to make a survey of the subject complete it would be necessary to consider the causes of the onset of labour, together with the nature of the action of the uterus during that period, and its involution after; also the pathological phenomena of menstruation and the obstetrical abnormalities of uterine inertia and tonic contraction. They have restricted their field to the consideration of the causes of the onset of labour and the factors regulating normal and abnormal uterine contractions during labour.

After a brief but interesting historical survey they review the anatomy and physiology of the subject, making reference in particular to the recent confirmation by Hofbauer of Purkinje's demonstration of a conducting system of specialized muscle fibres in the uterus. The changes in structure (for example, of the muscle fibres themselves) related to the performance of special functions are very important to understand, as they point out, for the interpretation of experimental results may be considerably affected thereby. But the bulk of their paper is concerned with the consideration of the various constituents of the blood as they concern the uterine function. These are under normal conditions the hormones and the ionized salts. The experimental methods employed were those based upon the behaviour of the excised uterus *in vitro* and the action of the uterus in the living animal. As regards the action of the follicular hormone on the uterus, their conclusion is that this is threefold, and they believe that œstrin acts by increasing the size of the muscle fibres, by sensitizing the muscle or nerve elements and by stimulating the production of infundibular hormone. The secretions of the anterior pituitary were also studied, but no attempt was made to separate the two hormones "Prolan A" and "Prolan B" that are believed to be produced there; a preparation containing the sex hormones, but excluding that related to growth, was used in the experimental work. They conclude that these secretions assist the *corpus luteum* in the early stages of human pregnancy (and perhaps even replacing it in the later months) in preventing the uterus from expelling its contents. The posterior pituitary secretion is simpler to study on the experimental side. In particular the effect of the two components pitocin and pitressin were investigated with regard to the reversal of the adrenaline effect on the excised uterus. It has just been remarked that œstrin stimulates the production of the infundibular secretion; these authors

¹ The Journal of Obstetrics and Gynaecology of the British Empire, June, 1933.

find that apparently this stimulus concerns the formation of both the uterus-contracting and the blood pressure-raising hormones equally. It would seem that the output of œstrin is definitely concerned with the onset of labour and that the secondary increase in the output of posterior pituitary secretion is of executive importance. It is suggested further that where an excess of œstrin is produced, an undue quantity of available pitressin may act on the placental blood vessels and thus bring about abortion. The suprarenal is known to be enhanced in its functional activity during pregnancy, but no fresh light is here cast on its action. The experiments on the salt concentration of the nutrient fluid supplied to the uterus confirm what is already known, that calcium is necessary for uterine contraction, and that magnesium acts as an inhibitor.

Of greater clinical interest are the observations made on cases of abortion. It was found that the urine of patients who presented evidence of missed labour and missed abortion, that is, when the foetus was dead, contained no œstrin. When active abortion was actually taking place, however, large amounts of œstrin could be demonstrated in the urine by the Aschheim-Zondek test. The application of this is that where abortion is threatened, injections of the *corpus luteum* hormone should inhibit the uterine contractions. There has been some clinical evidence of the value of this measure, though, of course, the "inevitable" abortion could not be influenced by any treatment. The influence of infundibular extract in determining the onset of labour is, of course, now well established, but it is interesting to realize that the experimental work puts it on a sure foundation. In cases of post-mature labour, or correctly, delayed or postponed labour, the use of œstrin is recommended and seems to be logical. Uterine inertia, it is suggested, is due to an insufficiency of infundibulin or calcium, and the reverse state of tonic contraction, where the amount of pressor substances is normal, but where obstruction exists, might reasonably be met by the administration of magnesium.

It is difficult to summarize a paper that is in itself a summary, but it may be said that it contains a condensed and clear account of the more important facts known concerning the action of the uterus. With the adoption of the experimental method the authors have made the right approach, but have not neglected that logical and practical application of their information to clinical problems that brings the laboratory in touch with the bedside.

PSORIASIS AND RHEUMATISM.

AN interesting comparison has recently been made between psoriasis and rheumatism by Elizabeth Hunt.¹ The association of these two conditions is known to be frequent. Garrod and Evans in 1924, after observing synchronizing

attacks of psoriasis and arthritis accompanied by hydrarthrosis, suggested that psoriasis with arthritis might be regarded as a clinical entity. Hunt regards this view as untenable. She points out, however, that of 53 patients with psoriasis, 80% gave a history of the occurrence of rheumatic infection in a near relative, and that only 35% gave a family history of psoriasis. Of the 53 psoriasis patients, 70% were suffering from arthritis or rheumatism. Hunt points out that the streptococcus has been accepted as the causative organism of rheumatism and that there is evidence of a relationship between psoriasis and tonsillitis that cannot be dismissed as a mere coincidence. Wingfield reported six cases of psoriasis following tonsillitis, and of Hunt's own patients with psoriasis, 50% gave a history of tonsillitis or throat trouble. She adds that the analogy between psoriasis and rheumatism is strengthened if the histological findings in the two conditions are compared. She discusses these findings and concludes that histologically the difference between the two conditions appears to be due to a difference in the tissues in which the reaction is localized—epidermal in psoriasis, subdermal in rheumatic nodules. Hunt goes on to discuss the part played by allergy. She refers to Clawson's work on allergy in the causation of rheumatic nodules and finds clinical evidence for suspecting allergy to be concerned in psoriasis. Many other questions are raised in Hunt's short but interesting article. Perhaps her most important suggestion is that in psoriasis the protective mechanism of the skin may have beneficial results. This suggestion is made in connexion with the observation that rheumatic subjects with psoriasis do not develop rheumatic cardiac lesions.

A PICTUREGRAM SERVICE.

THE Postmaster-General's Department of the Commonwealth announces that a picturegram service has been installed between Sydney and Melbourne. It should prove of value to members of the medical profession. Photographs of formulae, X ray photographs, and any printed, typewritten or written matter, or any combination thereof are accepted for transmission as picturegrams.

The transmission and reception of picturegrams is effected by a combination of electrical and photographic processes, and the time involved in the transmission of a picture of a size seven inches by ten inches between Sydney and Melbourne is approximately fifteen minutes, delivery of the facsimile to the addressee under normal conditions being effected within one hour of the handing in of the original picture. Matter for transmission as a picturegram should be handed in at the telegraph counter. The cost involved varies from thirty shillings for a "B" grade picturegram, size four inches by four inches, to sixty shillings for an "A" grade picturegram, size seven inches by ten inches. On the supplement page we reproduce an original skigram and a copy of a picturegram.

¹ *The Lancet*, August 12, 1933.

Abstracts from Current Medical Literature.

OPHTHALMOLOGY.

Hæmorrhage into a Prolapsed Vitreous Pouch.

T. H. BUTLER (*The British Journal of Ophthalmology*, June, 1933) refers to our doubtful knowledge of the structure of the vitreous. Duke-Elder and others think that the membranes are merely optical phenomena. Ida C. Mann believes that there are real membranes in the central part representing Cloquet's canal. As bearing on this question the author relates the following case. A man of sixty-six was operated upon for cataract following a preliminary iridectomy and followed by a discision. Five months later, the sight being bad, the eye was examined by the slit lamp. The eye was quiet and free of blood in the anterior chamber or upon the iris, but there was a prolapse of the vitreous into the anterior chamber, forming a biloculate pouch. The pouch was half full of fresh blood, forming a double collection. The fact that vitreous can prolapse in the form of a pouch capable of holding fluid seems to prove the existence of certain membranes.

Use of Mydriatics by Subconjunctival Injection.

F. FLYNN (*The British Journal of Ophthalmology*, May, 1933) comments on the frequent failure of atropine instillation to produce mydriasis in the presence of synechiæ or to produce maximum dilatation when this is required. It was found that when a synergic mixture of atropine, cocaine and suprenin was injected subconjunctivally, complete mydriasis was more likely to be effected. After some experiment the following mixture was decided upon. The solution, called mydricain, contains in each minim dose: atropine sulphate, grain $\frac{1}{60}$; cocaine hydrochloride, grain $\frac{1}{10}$; lævo-rotatory suprenin, grain $\frac{1}{600}$; sodium chloride, grain $\frac{1}{60}$; and "Chlorbutal", grain $\frac{1}{120}$, in sterilized water. It may be used in the initial stages of acute iritis, when posterior synechiæ are in process of formation. The injection should be made preferably near the limbus when a synechia is present. The rapidity of action is almost startling, beginning sometimes thirty seconds after injection.

The Aqueous Humour.

F. H. ADLER (*Archives of Ophthalmology*, July, 1933) refers to the various theories about the origin of the aqueous humour. Referring to the modern theory that it is a dialysate, he agrees that the dissociated crystalloids, such as sodium chloride, with excess of cations (sodium) in the blood and excess of anions (chlorine) in the aqueous, behave in agreement with this con-

ception. The non-dissociated crystalloids, such as sugar and urea, are not subject to any electrical constraints and should appear in equal concentration in the blood and aqueous, if the latter is actually a dialysate. The author has already reported the finding of a lower concentration of sugar in the aqueous as compared with the blood, but admits that this may be due to the fact that sugar is used by the tissues which form the anterior chamber. In the vitreous, too, the sugar concentration is very low, owing to the rapid glycolysis by the retina. This explanation does not apply to urea. The present paper is mainly concerned with experiments to determine the concentration of urea in the aqueous and blood of cats, the fluids being withdrawn simultaneously. Eight cats were employed in this work and the conclusion is reached that the concentration of urea in the aqueous is about 18% less per unit volume than that in the blood. The aqueous therefore cannot be a dialysate.

The Retina in Hæmochromatosis.

KEMPSON MADDOX (*The British Journal of Ophthalmology*, July, 1933) describes hæmochromatosis as a derangement of liver and possibly of pancreatic metabolism, whereby excessive deposits of iron and copper are laid down in almost all organs and tissues, including the ectodermal structures. There occur enlargement of the liver, biliary cirrhosis and interstitial fibrosis of the pancreas, producing a clinical picture of diabetes mellitus with discoloration of the skin—diabète bronzé. In four cases studied the ocular fundus was examined and in all retinal pigmentary changes were found. The pigment deposition was of a diffuse and uniform character, but especially concentrated around some or all of the disk margin. The pigment was of a deep slaty blue colour, darker near the disk. The pigment is probably hæmofuscin. Milder cases are apt to pass unnoticed by the clinician, so the ophthalmologist may perhaps be the first to call attention to the condition.

Kayser-Fleischer Ring in Wilson's Disease.

F. L. DUNNAN AND M. P. MOTTO (*American Journal of Ophthalmology*, July, 1933) describe the Kayser-Fleischer ring, seen in Wilson's disease, or progressive hepatolenticular degeneration, as a narrow band of pigmentation about two millimetres wide at the limbus of the cornea. The colour is brownish green, and examination with the slit lamp reveals that the pigmentation is in Descemet's membrane and consists of dark brown granules, a finding confirmed by histological study. The composition of the pigment granules has not yet been determined. In 1912 Wilson published his monograph on progressive lenticular degeneration, a familial nervous disease associated with cirrhosis of the liver. It affects

the extra-pyramidal motor system and is characterized by tremor, spasticity and progressive emaciation. In 1922 Jendralski reported in a family of seven children four showing the typical Kayser-Fleischer ring. Two had pronounced symptoms of Wilson's disease, and a third, on autopsy, showed the usual liver degeneration. The case is reported of a white girl, fourteen years of age, suffering from lack of appetite, retarded and laborious speech, and inability to walk or sleep well. She had been under treatment for two years for encephalitis. The corneal ring was present. This can be relied upon for a differential diagnosis in Wilson's disease.

Intracapsular Extraction of Lens Containing a Foreign Body.

B. CHANCE (*American Journal of Ophthalmology*, July, 1933) reports three cases in which he extracted the cataractous lens in its capsule containing a foreign body. The extraction was in each case accomplished by means of a capsule forceps assisted by pressure at the lower margin of the cornea. Good visual results were obtained. The author contrasts this method with other procedures which often lead to trouble.

OTO-RHINO-LARYNGOLOGY.

Effects of Radiation on Allergic Nasal Mucosa.

L. B. BERNHEIMER AND MAX CUTLER (*Archives of Otolaryngology*, May, 1933), in a further report on the effects of radiation on allergic nasal mucosa, evaluate treatment by radiation. Fifty-two per centum of the patients irradiated were symptom-free after one year, 20% no longer had nasal block or watery discharge; so that while sneezing still persisted in a moderate degree, the clinical result from the standpoint of the patient's comfort was excellent. Eight per centum were moderately comfortable, their breathing space remaining unimpaired, although sneezing and discharge persisted; 10% received but little relief, and 10% were not benefited. After cocaineization of the nasal mucosa 50 milligrammes of radium were introduced into each nasal chamber and allowed to remain in place for two hours (total dose, 200 milligramme-hours). The radium element was held in four brass capsules, each capsule containing 25 milligrammes of radium in silver containers. The total filtration was 0.5 millimetre of silver and 1.0 millimetre of brass. One capsule was placed in each middle meatus and one in each inferior meatus. Usually both sides of the nose were irradiated simultaneously.

Otitis Media in Scarlet Fever.

HORACE J. WILLIAMS (*Archives of Otolaryngology*, February, 1933) discusses the aural complications in patients with scarlet fever which

occurred during the years from 1922 to 1929, inclusive, at the Philadelphia Hospital for Contagious Diseases. The author concludes that the incidence of *otitis media* in a series of 14,733 patients with scarlet fever was 10.8%. In about one-third of them the disease was bilateral. The incidence of mastoiditis requiring surgical treatment was 1.1%. The mortality in a series of 1,535 patients with scarlet fever with acute suppurative *otitis media* was 4%. The mortality in a series of 167 patients with scarlet fever on whom mastoidectomy was performed was 10.8%. Early incision of a bulging tympanic membrane and incision of a ruptured tympanic membrane when the rupture is inadequate for proper drainage tend to lower the incidence of acute mastoiditis requiring surgical intervention in scarlatinal otitis. Repeated incision of a tympanic membrane is seldom of value. Of the 1,535 patients with acute suppurative scarlatinal *otitis media* 91.5% were children under ten years of age. The peculiarity of the Eustachian tube in the child and the concurrence of pharyngeal and faucial tonsils and paranasal sinusitis predispose to the development of acute and chronic aural complications. Aural complications of any degree of severity may arise at any time from the first day of the acute symptoms to the last day of the convalescence. The incidence of tonsillectomy and adenoidectomy in a series of 14,733 patients with scarlet fever was 6.8%. There is no great tendency for the disease to extend from the bone to the meninges, as shown by a total of seven patients with meningitis from a series of 14,733 patients with scarlet fever. Not infrequently the infection passes through the middle ear and appears as a post-auricular oedema, redness or a subperiosteal abscess, leaving the tympanic membrane intact. The useful principles of treatment available today are essentially those that were available twenty years ago.

Development of the Mastoid Air Cells.

A. BROWNIE SMITH (*The Journal of Laryngology and Otology*, April, 1933) presents an investigation into the development of the mastoid air cells. It consisted in the histological examination of twenty temporal bones at ages from birth to ten and a half years, of the nasal cavities, maxillary air sinuses, ethmoidal air cells and lower end of the femur in one case and of the sphenoidal sinus in another. The author concludes that the mastoid air cells are formed by resorption of the bony walls of the mastoid antrum by osteoclasts, penetration of the subepithelial connective tissue into the spaces hollowed out by these multinucleated cells, replacement of the bone marrow by this tissue, degeneration and absorption of the central part of the connective tissue followed by its condensation as a thin layer on the surface of the bone and proliferation of the epithelium, which follows the regression of the connective tissue and remains in contact with it. The maxillary air cavity develops in a similar manner, but the relative absence of bone marrow accounts for its smooth walls compared to the irregular air cell development of the mastoid process. It is doubtful whether hyperplastic changes in the epithelial layer play any part in preventing development of the mastoid air cells. The subepithelial connective tissue is most abundant when the mastoid air cells are still in the process of development. Once these are fully developed, this connective tissue becomes indistinguishable from adult fibrous tissue and forms a very thin layer on the bony wall of the air cell. The constitution of the osseous tissue of the mastoid process is the determining factor in the development or non-development of the air cells.

"Avertin" Anaesthesia in Operations on the Upper Respiratory Tract.

FRANCIS SHIPWAY (*The Journal of Laryngology and Otology*, June, 1933), discussing the employment of "Avertin" anaesthesia in operations on the upper respiratory tract, states that the selection of a pre-anaesthetic hypnotic or narcotic in surgery of the nose and throat is very largely governed by its action upon the cough reflex. During the operation the surgeon is not concerned about the effect of the drug upon this reflex. The anaesthetist can place at his disposal a choice of methods and of apparatus which prevent the incursion of blood or fluids into the trachea. It is during the period of recovery that the presence of the cough reflex is essential. In advocating the use of such a powerful narcotic as "Avertin", assurance must be given of its ability to produce the pre-operative conditions required by the patient without placing him in a position of danger when the operation has been completed. There would appear to be no age limit to the use of "Avertin", and there are but few operations in which it cannot be employed; of the patients who underwent tonsillectomy, three were sixty years of age or more. The sleep which follows the administration of "Avertin" varies in duration and in depth. In the majority there is no need for a sedative, sleep being undisturbed and not of a depth which would allow a quiet invasion of the trachea by blood. The patient, when put back to bed, should be placed in the lateral posture, and if there is any tendency for the jaw to fall back, an airway should be inserted.

The Treatment of Chronic Suppurative Otitis.

T. RITCHIE RODGER (*The Journal of Laryngology and Otology*, August, 1933), in a paper dealing with the treatment of chronic suppurative otitis, regards the subject as a problem, social as well as surgical. The author is of the opinion that considerable progress is being made, but

that this might be greatly accelerated. Of the different methods of non-operative treatment he prefers the dry treatment after a thorough preliminary cleansing. The ear is first syringed to clean the meatus. The middle ear is then thoroughly irrigated, a Hartmann's cannula being insinuated into a perforation or against it. When the return flow has become clear the ear is mopped dry. The patient is then made to inflate the ear by Valsalva's method, while the surgeon holds a final mop in readiness to catch the moist bubbles, until the escaping air has a dry sound. When the ear has been thus thoroughly cleansed and dried the inner part of the meatus is filled with fine boracic powder blown in by an insufflator. In some cases small granulations or polypi may have to be removed, and in these cases the prognosis is not so good, although many patients do quite well. Search must also be made for any nasal or pharyngeal condition which might militate against success, and these must be rectified. In quite a moderately high proportion of cases the ear remains dry after the first treatment. It would seem that in these cases some inspissated material has been lodged behind the lip of the perforation and is acting as a foreign body. The patient is instructed to return whenever the powder becomes moist, when the same procedure is followed. It is wise to give him an appointment for two weeks later in any case, as there may be moisture without his being aware of it. A large perforation may not heal, but if the ear remains dry for a considerable period, it may be assumed that the suppuration is confined to the middle ear and any recurrence is confidently tackled in similar fashion. The patients must be regularly seen by the surgeon himself, and if satisfactory progress is not shown within a reasonable time, operation should be advised.

Malignant Disease of the Oro-Pharynx and Fauces.

NORMAN PATTERSON (*The Journal of Laryngology and Otology*, July, 1933) stresses the importance of diathermy in the treatment of malignant disease of the oro-pharynx. He holds the view that if there is a good chance of completely removing the tumour without undue risk to the patient, endothermy excision should be carried out, combined, in selected cases, with drastic surgical removal of the gland-bearing areas. In the majority of cases irradiation should follow operation. When a gland operation is thought to be desirable the author's practice is generally to operate on the glands on the diseased side and then to allow a period of from two to three weeks to elapse before dealing with the primary tumour. The external carotid artery is generally ligated at the time of the gland operation. A table is given indicating the survival after operation of patients treated by diathermy or endothermy excision.

Special Articles on Treatment.

(Contributed by request.)

XX.

TREATMENT OF OTITIS MEDIA.

WHEN considering the treatment of *otitis media* it is most important that we possess a clear understanding of the formation of the middle ear cleft. This may be regarded as a passage-way with different compartments leading from the naso-pharynx to open finally into the mastoid air cells. The mouth of the cleft (Eustachian orifice) is situated in the lateral wall of the naso-pharynx and opens during the acts of swallowing and yawning; at rest it is closed.

The fossa of Rosenmüller is a pouch in the lateral wall, situated above the Eustachian cushion, and is worthy of close attention in the treatment of *otitis media*.

The Eustachian tube follows a length of 3.75 centimetres (one and a half inches), entering by a wide opening into the anterior wall of the middle ear. The middle ear cavity, that is, the cavity between the external auditory meatus and the inner ear may be divided into: (i) An upper compartment which is bounded externally by Shrapnell's membrane and the outer bony wall of the attic. It contains the major part of the ossicles and their ligaments. (ii) A lower compartment bounded by the *membrana tensa*. The upper compartment communicates by means of the aditus with the mastoid antrum, and the mastoid air cells bud off from the antrum.

All parts of the middle ear cleft are lined by a continuous layer of ciliated columnar epithelium. Ventilation occurs during the act of swallowing. All secretions from the various parts drain normally into the lateral part of the naso-pharynx, being swept along by the action of the cilia.

We realize, therefore, that when considering the treatment of an inflammation of a middle ear we must understand that the other parts of the middle ear cleft are also more or less inflamed and require appropriate treatment in order to clear up the *otitis media* and restore normal function.

The treatment of the particular form of *otitis media* will, of course, vary according to the particular kind and degree of inflammation that is present in each case. For the purpose of description one might classify them as follows: (i) Catarrhal *otitis media*: acute, subacute, chronic; (ii) acute *otitis media*: dry, serous, purulent; (iii) chronic *otitis media*: dry, suppurative; (iv) *otitis media* in children.

Acute or Subacute Catarrhal Otitis Media.

In acute or subacute catarrhal *otitis media* the coryza with which this condition is usually associated has to be treated by ordinary measures, including dry and wet inhalations *et cetera*.

The membrane lining the Eustachian tube is swollen and ventilation of the middle ear is obstructed; therefore inflation by Politzer's method or by means of the Eustachian catheter is carried out, at first each day, later at longer intervals until such symptoms as the feeling of fullness in the ear radiating to the surrounding areas, defective hearing and tinnitus disappear.

In many cases one finds at first that it is not possible to inflate the Eustachian tube to the middle ear, even after having caused constriction of the tissues of the Eustachian orifice with cocaine and adrenaline. It is generally advisable not to persist, but to wait until the next day and to try again then.

Acute Otitis Media.

In the early stage of acute *otitis media*, when pain and discomfort are complained of, examination generally shows a reddened drum without any bulging. Pyrexia may or may not be present. In such a state warmed glycerine and carbolic acid drops put in three times a day, a pad

of warm cotton wool over the affected ear, and an aspirin mixture to alleviate the pain are all that is necessary.

The principal endeavour in the early stage is to limit, as far as possible, the inflammation and to maintain ventilation and drainage of the middle ear into the naso-pharynx *via* the Eustachian tube. Therefore one prescribes hot steam inhalation of Friar's balsam, one every two or three hours during the day. Ten minutes should be occupied at each inhalation. During the night, if the patient be awake, one inhalation may also be given.

By means of posturing the head, one encourages drainage by gravity from the middle ear to the naso-pharynx, and repetition of the act of swallowing whilst the head is in such a position. A hot water bottle seems to alleviate the pain better than fomentations. Leeches over the mastoid process are sometimes recommended in order to reduce the congestion.

Many cases will subside and return to normal in a week or so. But in many there is a periodic retention of serous fluid in the middle ear, which later tends to become purulent. The drainage into the naso-pharynx is not adequate.

It is not uncommon to find on inspection of the drum early in the course of an *otitis media*, especially in influenza cases, that there are one or more hemorrhagic bullae present, usually on the posterior half, sometimes on the adjoining wall of the external auditory canal. These blisters usually rupture in the course of forty-eight hours and a thin, blood-stained discharge appears. The drum is not perforated and usually the *otitis media* quietly settles down. Incising these blisters does not seem necessary, and certainly a myringotomy is not. Simply keep the canal clean.

If there is a marked bulging of the drum due to persistent defective drainage, then the drum should be incised. When this small operation is to be performed, it is much better if we can time it so that pus is evacuated.

There does not appear any valid reason why a paracentesis should be done before definite signs of defective drainage of the products of inflammation, sero-sanguineous or purulent, appear in the middle ear. One has often observed that, when a paracentesis has been done in the early stage and probably only blood from the inflamed congested drum and a little serum have appeared, the mucosa closes up, and that later on, when pus forms, another myringotomy has to be done. When pus is present in the middle ear, but drainage *via* the Eustachian tube is adequate, there is surely no need for an incision in the drum.

There are cases in which the collection of pus under tension in the middle ear varies from day to day, and the incision needs to be kept open. This can be done painlessly by the use of Bonain's solution (that is, equal parts of menthol, carbolic acid and cocaine hydrochloride). The drops are instilled into the auditory canal and the head is postured so that the anæsthetic solution lies in contact with the drum. One should wait fifteen minutes before operating on the drum, which will appear white.

The operation of incising the tympanic membrane may be performed quite painlessly in the majority of cases by means of Bonain's solution. When a general anæsthetic is decided on, it is necessary to use one that provides ample time for the cleaning of debris from the auditory canal, careful inspection of the drum and incision of this membrane in the usual posterior quadrant. A mere stab with a paracentesis needle is not sufficient. A definite incision must be made, extending down to the floor of the external auditory canal. If it is a very thick membrane, a cross-cut through the first incision will help to maintain better drainage. Drainage through the external auditory canal having been established, this canal has to be kept clear by the use of frequent ear toilets, the dry-method being used.

The dry method may be described as follows: (i) Dry out the discharge with wool pledgets. (ii) Instil warm weak hydrogen peroxide drops (one in four) and leave these in for three minutes. (iii) Dry out the canal again. (iv) Instil antiseptic drops, such as boric spirit; mercuriochrome 2%, either in aqueous solution or in 30% spirit; *et cetera*.

It has been suggested that hydrogen peroxide drops tend to spread the inflammation, leading to the necessity for a mastoid operation, but in practice one does not find that this occurs. Spirit, of course, is painful, especially in the early stages. A pad of wool and bandage covers the pinna.

The patient is kept in a room with a warm equable temperature, care being taken to see that this temperature remains constant during the night as well as during the day.

In an average case the discharge continues for a week or ten days, though in some cases it goes on for three or four weeks before clearing up. A profuse discharge usually indicates that suppuration in the mastoid antrum is marked, and when the drainage from this area is inadequate, then this cavity must be opened up and drained behind the ear.

The ideal time to perform a mastoid antrostomy is when pus is present. It is a mistake to operate too early and to find simply congested bone and mucous membrane with, maybe, a little serous fluid, because the complication of a generalized blood infection is more likely to occur.

I do not propose to describe the technique of the mastoid operation.

Chronic Otitis Media.

The Dry Stage.

During the dry stage of chronic *otitis media* the only treatment required is that directed towards prevention of suppuration. Water is to be prevented from entering the middle ear, and infection from the naso-pharynx *via* the Eustachian tube guarded against. Scales and cerumen are to be removed at regular periods. No drops should be instilled into the ear.

The Purulent Stage.

There are two methods of treatment of the purulent stage:

The Wet Method.—In the wet method the ear is syringed out with warm lotion. It is thoroughly dried. Antiseptic drops are instilled (boric spirit, mercurochrome, gentian violet, iodine *et cetera*).

The Dry Method.—In the dry method no syringing is done; the canal is simply dried out with cotton wool mops, dilute hydrogen peroxide (one in four) being used first when there is much *débris* or when the discharge is very thick. Then perflate by Politzer's method, dry out the ear again, and instil antiseptic drops. The frequency of such ear toilet is indicated by the amount of the discharge. It is advisable to change the antiseptic drops frequently. Granulations are cauterized with fused silver nitrate, chromic acid or trichloroacetic acid. Aural polypi are generally removed with a snare under a general anæsthetic. The site of the perforation indicates the direction for special treatment. The anterior inferior perforation in the *membrana tensa* indicates special treatment of the anterior parts of the middle ear cleft infection. A perforation of Shrapnell's membrane indicates special treatment towards the attic and posterior middle ear cleft infection, particularly the attic, where cholesteatoma frequently occurs. In these cases a mastoid operation is generally indicated.

Other Methods.—Other forms of treatment of a chronic suppurative *otitis media* include:

1. Treatment by finely powdered magnesium sulphate. The ear is dried out and then powdered with the desiccated magnesium sulphate.

2. Treatment by zinc ionization, where there is a large perforation and the zinc sulphate solution can come into contact with all infected mucosæ. It is doubtful whether this mode of treatment has any special recommendation. D. M. Lierle and R. A. Sage,⁽¹⁾ experimenting with zinc, found no evidence of impregnation, stating that the possibility of the deposition of metallic zinc in the living tissue is remote and open to question. Hearing may be improved by using a pledget of cotton wool moistened with glycerine and inserted so that part goes through the perforation of the drum and is in contact with the inner

wall of the tympanum. It is taken out at night and is not worn during stages of suppuration.

Pathological conditions of the nose, nasal sinuses, naso-pharynx and oro-pharynx are often present and may require operation; this should be done only in the quiescent stage, when no acute inflammation is present.

Otitis Media in Children.

In children also the form of *otitis media* varies from a mild catarrh associated with a *ryza* to an acute suppuration with a red bulging drum. The drum head in a young child is thicker than that of an adult, and there is less tendency to bulging and spontaneous rupture is delayed (Alexander). On the other hand, drainage by the Eustachian tube is easier than in the adult.

Many cases of *otitis media* in children subside without rupture of the drum, and it would appear to be a mistake to incise the drum until there is definite evidence of pus under tension. The time interval will vary with the virulence of the infection and the resistance of the child.

Then any factor which tends to obstruct drainage *via* the Eustachian tube will retard healing and tend to cause complications. It is as well to remember that the drum in a child will bulge very much during the act of crying.

One is not able to state any particular time for operative interference in *otitis media*; each case differs. One is guided solely by the state of the drainage of the products of inflammation, whether this be adequate or not. Once we have done something to improve this drainage, then we must see that it is maintained until healing takes place and inflammation subsides. Premature operative interference would appear to do more harm than good in acute inflammatory conditions.

Reference.

⁽¹⁾ D. M. Lierle and R. A. Sage: "Underlying Factors in Zinc Ionization Treatment of Middle Ear Infections", *Annals of Otolaryngology and Rhinology*, Volume XVI, 1932, page 359.

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British Medical Association News.

SCIENTIFIC.

A MEETING OF THE VICTORIAN BRANCH OF THE BRITISH MEDICAL ASSOCIATION was held at the Melbourne Hospital on May 17, 1933. The meeting took the form of a series of clinical demonstrations by the members of the honorary staff. Parts of this report have appeared in the issues of October 14 and 21, 1933.

Tic Douloureux and Sluder's Neuralgia.

DR. A. E. COATES showed a series of patients illustrating the results of (a) alcohol injection and (b) section of the posterior root of the Gasserian ganglion for *tic douloureux* and Sluder's neuralgia.

Mrs. H. had *tic douloureux* for three years. The pain commenced in the right upper lip and radiated over the maxillary nerve area. Five months ago, alcohol injection of the Gasserian ganglion by Hartel's method was done. The maxillary portion of the ganglion only was injected, the ophthalmic and mandibular areas being left unaffected. Complete relief of pain was obtained. Anæsthesia persisted over the area supplied by the maxillary division.

A more severe case was that of Mrs. F., who had paroxysmal pain accompanied by facial spasm and lachrymation for three and a half years. The pain commenced near the ala of the nose on the right maxillary region. A trigger area was present here. The pain radiated all over the right trigeminal field during severe attacks. Dental and antral disease were excluded. Injection of the

Gasserian ganglion seven months ago completely relieved the patient. Only four minims of alcohol were used, and the injection was limited to the maxillary portion of the ganglion. The patient had a recurrence of pain two weeks ago. Seven minims of alcohol were then injected into the Gasserian ganglion, the injection producing anaesthesia of the ophthalmic area as well as the field of maxillary division. The patient was completely relieved. The eyelids were sutured together in order to prevent destruction of the cornea by trophic ulcers. The patient had gained in weight since the injection. She could wear her dentures and eat well. The mandibular portion of the nerve was spared, so that mastication might not be impaired.

The third patient, a man of sixty-eight, had *tic douloureux* for fourteen years. The maximum pain was felt over the left temporal region. Alcohol injection of the mandibular nerve six years ago arrested the attacks for one year. Severe paroxysms were experienced since then, and he lost weight and was generally miserable. Alcohol injection of the Gasserian ganglion was followed by anaesthesia of the whole trigeminal field, but pain persisted. Section of the posterior root of the Gasserian ganglion in January, 1933, was followed by complete relief. Except for a slight inflammation of a pterygium, no eye symptoms developed. Increase in weight and a changed outlook on life resulted from the relief of the pain. The motor root was left intact, so that mastication was unimpaired.

Contrasted with these cases of graduated severity of paroxysmal neuralgia were two cases (Miss S. and Mr. H.) of Sluder's neuralgia. Both patients had had thirty-three operations on the nose, accessory sinuses and mastoid. Miss S. had, in addition, had a labyrinthectomy. Mr. H. had severe left frontal pain and was unrelieved by his many operations; he was rather made worse thereby. Miss S. had severe temporal and facial pain, unrelieved by operation.

At the request of the surgeon in charge of these patients, the posterior root of the Gasserian ganglion was divided. No relief of pain was experienced. Miss S. was then subjected to resection of the superior cervical ganglion of the sympathetic trunk on the same side, and also to periarterial stripping of the common carotid artery. No relief of pain was obtained. The sphenopalatine ganglion was cocaineized and also injected with alcohol, again with no relief. These drastic measures failing to relieve the pain, Dr. Coates was forced to the conclusion that the fifth cranial nerve was not the one involved in this vague form of neuralgia. Neither was the sympathetic the pathway of the painful impulses. It was suggested that the cause of pain was similar to that in ascending neuritis of painful amputation stumps, and perhaps the facial nerve might be responsible for the conduction of the painful impulses.

The series indicated that for milder and early forms of true *tic douloureux* alcohol injection through the foramen ovale was successful. Care should be taken to watch the cornea when the ophthalmic area was anaesthetized. More severe cases were best treated by section of the sensory division of the fifth nerve. Sluder's neuralgia did not seem to respond to the surgical measures employed.

Resection of Presacral Nerve and Sympathetic Ganglionectomy.

Dr. Coates also showed a male patient who was admitted to the Melbourne Hospital in 1909 for fracture dislocation of the first lumbar vertebra. He was operated on by Dr. Langlands. Since 1909 the patient had had precipitancy of micturition and defecation, but no actual incontinence. Since 1910 the feet had become swollen, reddish in colour, and later purple. There was a serous discharge from the toes. Relief was obtained by hot foot baths. There was a sore over the left lateral malleolus and loss of the ends of the toes from previous ulceration. Recently he had dribbling incontinence of urine. The urine was dirty. He could not wear boots or shoes because of the sore toes.

The patient was admitted to hospital on June 28, 1932. The sensation to light touch was absent about the toes on both feet and along the dorsum of the foot, 2.5 centimetres

(one inch) proximal to the webs of the toes. There was loss of power and wasting in the muscles of the legs and the posterior muscles of the thighs. The residual urine was 600 cubic centimetres (twenty ounces). The clothes and bed were always wet.

On June 29, 1932, an operation was performed in which the following were done: Excision of the hypogastric nerve, excision of portion of the right sympathetic trunk and lumbar ganglia, and also of the left sympathetic trunk and lumbar ganglia.

On June 30, 1932, there was improved touch sensation in the feet. A pulse in his feet could be felt. The patient's bladder was catheterized twice daily. Spasm of the urethral sphincter was noted.

On July 13, 1932, he was passing urine satisfactorily. There was some incontinence of faeces occasionally.

By July 30, 1932, the sore over the malleolus healed, but there was still precipitancy of micturition. The residual urine was 60 cubic centimetres (two ounces). There was no rectal trouble. He was discharged on August 3, 1932.

He was examined on May 12, 1933. He could control his urine. He had frequency three times at night, but the beds and clothing were now dry. He wore boots, whereas he could not tolerate slippers before the operation. The patient had been improved beyond the most sanguine expectations.

Immediate Suture of the Median and Ulnar Nerves and Flexor Tendons.

Dr. Coates showed a man, aged twenty-six years. All his flexor tendons and the median and ulnar nerves were divided 7.5 centimetres (three inches) above the wrist in a machine accident sixteen months ago. The tendons were sutured with silk and the nerves with fine catgut. The wrist was put up in acute flexion for four weeks. Complete recovery of tendon function resulted. The patient recovered sensation to touch and pin prick of the hand and partial recovery of motor power of the small muscles of the hypothenar area and also the thenar area. The interosseal muscles had not recovered. Massage and electrical treatment were still being continued and further recovery seemed probable.

Disseminated Sclerosis.

Dr. GEOFFREY PENINGTON showed a male patient, aged thirty-seven years, an actor, who had been under observation for fifteen months. The history was that eleven years ago he had become nervous and excitable, was constipated, and found it necessary to strain to secure an effective bowel action. Two years later he noticed weakness of the left leg and occasionally became lame. This occurred in attacks which lasted about ten days, with remissions of about two months' duration. There were occasional sensations of pins and needles in the left leg. Two years ago he noticed precipitancy of micturition and lumps behind the left knee, and eighteen months ago there were aching pains in the feet at night. When he was first seen he was bedridden owing to the sudden onset of loss of power in the lower limbs preventing walking, but within two months he had recovered sufficiently to be able to walk with the aid of a stick. During the past twelve months he has been subject to sudden outbursts of temper on the slightest provocation, although optimistic regarding his recovery. He had been aware of difficulty in speaking, especially if excited, during the eleven years.

With the exception that the systolic and diastolic blood pressure readings were 160 millimetres and 120 millimetres of mercury respectively, and Baker's cysts were palpable behind the left knee joint, no organic lesion was detected other than in the nervous system. Occasionally nystagmoid movements were present in the eyes, but the cranial nerve functions were otherwise normal. There were weakness and spasticity in the lower limbs, especially the left, and a spastic ataxic gait. Tendon reflexes in the upper limbs were equal and active, but in the lower limbs they were hyperactive and more marked on the left side. The epigastric reflexes were equal and active, but the lower superficial abdominal reflexes could not be elicited. There was a bilateral ankle clonus and Babinski reflex.

Joint sense, vibration sense, appreciation and localization of light touch, pressure pain and discrimination between two points were all defective over the lower limbs; pin prick was appreciated less over the same area. Differences in temperature were recognized, excepting over the dorsum of the left foot.

Neither blood nor cerebro-spinal fluid reacted to the Wassermann test. The cerebro-spinal fluid was under normal pressure, and globulin and cell contents were normal, while there was also no reaction with colloidal gold. Lipiodol *descendens* was not arrested in its descent in the spinal theca.

While the patient was under observation two generalized convulsions occurred, once during attempted cisternal puncture and again some hours after an intramuscular injection of 0.1 gramme of "Sulpharsenol". There had been no progression of the condition during fifteen months.

It was pointed out that the case illustrated very well the emotional changes which occurred in disseminated sclerosis, the necessity for excluding pressure on the spinal cord in some cases, the extensive sensory changes occasionally found, and the typical relapses and remissions. The escape from cranial nerve involvement was unusually marked. Treatment had consisted in the administration of arsenic and bromides by mouth, and latterly the attempted use of "Sulpharsenol", but the use of pyrexial therapy and other arsenical compounds, such as silver "Salvarsan", was discussed.

Dr. Penington's second patient was a male, aged thirty-nine years, by occupation a motor body builder, who complained of gradually decreasing power in the right lower limb for eight to ten years, and of variable numbness of the tips of the three ulnar digits of the right hand for about eight years. For two years he had suffered from repeated crops of boils. There had been no visceral symptoms or visual disturbance, and general medical examination revealed no lesion other than in the nervous system.

There was definite horizontal nystagmus, but the slight pallor of the temporal halves of the optic disks was considered to be within the limits of normality. The right lower limb was weak and spastic, and the gait was awkward, owing to the effort to prevent scraping the right foot on the ground. The tendon reflexes were hyperactive but equal in the upper limbs; the right knee jerk was more active than the left; the ankle jerks were equal and active. The superficial abdominal reflexes could not be elicited; the right plantar reflexes gave a typical extensor response and the left was equivocal but definitely abnormal.

Vibration sense was decreased on the right leg, and there was decreased appreciation of light touch and pin prick on the tips of the fingers mentioned above, but sensation was otherwise normal. The blood did not react to the Wassermann test.

It was pointed out that the long course of the illness, the variable subjective anesthesia, the presence of nystagmus, which was most marked in the abducted eye, absence of superficial abdominal reflexes on both sides, and abnormal plantar responses with such slight sensory changes all pointed to disseminated sclerosis as the cause of the condition. Lumbar puncture had been advised, but was refused, and in view of the fact that about 38% of patients with disseminated sclerosis develop further signs within two to three weeks of the procedure, it had been considered inadvisable to urge the patient to submit to it.

Tabes Dorsalis: Kümmell's Disease.

Dr. Penington also showed a female patient, aged sixty-six years, by occupation a cook, who had been complaining of severe backache and rapid intermittent swelling of the abdomen occurring irregularly and without relation to meals during the preceding eleven months. The swelling of the abdomen would sometimes last a few hours, but had no relation to the backache.

For years she had been subject to sudden sharp shooting pains in the upper limbs about the chest and in the lumbar region, and had noticed difficulty in walking in the dark. Inquiry into the past history had elicited that twenty-five years previously she had had dropsy for three weeks, which was said to be causeless. Three years

ago, while being driven in a motor car, her head had been struck on the hood of the car and immediately she had severe pain at the lower thoracic portion of the spinal column. This pain had been extremely severe for six months and had been present in lesser degree ever since.

She had had thirteen pregnancies, all but three of which terminated prematurely, and only two children had survived, the others dying in convulsions. She had been married twice, the first husband having died from cardiac disease, while the second suffered from disease of the heart.

Examination of the lungs and abdomen revealed no organic lesion, but the abdomen was lax and pendulous. The blood pressure was normal, but there was a pendular cardiac rhythm and the aortic second sound was rather booming in character. There was slight bilateral ptosis with compensatory elevation of the eyebrows. Typical Argyll-Robertson pupils were present, the pupils being unequal, irregular, small and without any reaction to light, while a brisk reaction occurred on accommodation. With the exception of a slight left triceps jerk, all tendon reflexes were absent. The right plantar reflex was flexor, but a Babinski response was elicited on the left side.

Joint sense was grossly defective in the great toes and there was slight ataxia in the lower limbs and definite Rombergism. Alteration of sensibility to pin prick was detectable on the ulnar border of the left forearm, but other abnormalities of sensation could not be detected.

Marked kyphosis was present in the lower thoracic region, with tenderness over the tenth thoracic to the first lumbar spinous processes. Radiological examination of this region revealed almost complete collapse of the body of the tenth thoracic vertebra with lateral spreading and rarefaction; the body of the first lumbar vertebra showed some collapse; spondylitis of these and the intervening vertebrae was present.

The blood had given no reaction with the Wassermann test even after a provocative injection of "Novarsenobillon".

Lumbar puncture had not been performed, as the patient was awaiting admission to hospital. A Taylor's brace had been worn for four months, but without alleviation of the pain in the back, and it was considered highly probable that in view of the development of a Babinski reflex some degree of compression of the spinal cord was present. It was proposed to perform lumbar puncture and Queckenstedt's test and to inject lipiodol *descendens* after cisternal puncture.

Dr. W. D. UPJOHN suggested the necessity for radiological examination of bone elsewhere to determine whether there was any osseous change with decalcification which might explain the extensive vertebral change with a history of relatively slight trauma.

Tumour of Spinal Cord.

The next case shown by Dr. Penington had been reported in full in the *Melbourne Hospital Clinical Reports*, Volume XIX. It illustrated some difficulties in the diagnosis of tumour of the spinal cord and the excellent results obtainable by operative removal of the tumour.

A male patient, aged forty-nine years, a builder and contractor, attended at the Melbourne Hospital on March 6, 1930, complaining of pain in the sacral region for twelve months. Three stages were discernible in the history:

(i) An insidious onset with sharp shooting pain commencing in the sacral region, extending to the lumbar region, left thigh and left lower part of the abdomen. The pains gradually became more severe and were "like knives going through the back". This stage lasted six months. (ii) The severity of the pain decreased for three months. (iii) The pain during the last three months had increased in severity and extended to involve both thighs, especially the left, and the left knee tended to "give way" when he was walking. He had increasing difficulty in commencing the acts of micturition and defaecation.

He had lost over 12.6 kilograms (two stone) in weight in the twelve months. Examination revealed no abnormality excepting in the nervous system below the level of the tenth thoracic nerves.

There was wasting and weakness of the *quadriceps femoris* on both sides, but especially the left. The knee

and ankle jerks were equal and hyperactive, and slight ankle clonus was present. The superficial hypogastric reflexes could not be elicited, but the cremasteric and superficial anal reflexes were normal. The right plantar reflex was flexor in type; the left could not be elicited.

Appreciation of light touch was absent over the fourth and fifth lumbar dermatomes, and appreciation of pin prick and temperature was impaired over the fourth and grossly deficient over the fifth. Application of a cold object over the fifth resulted in an unpleasant and exaggerated feeling tone. There was hyperaesthesia of the soles of the feet.

It was considered on this evidence that there was involvement of the spinal roots as high as the eleventh thoracic, and that the fourth and fifth lumbar segments were involved, while the *cauda equina* and sacral segments escaped. The lesion was apparently a tumour at the level of the twelfth thoracic vertebra. Blood counts and films were normal, the blood did not react to the Wassermann test, and no reaction was obtained with Casoni's test. Cisternal puncture revealed normal fluid, and lipiodol *descendens* was arrested with a concave lower border at the upper margin of the twelfth thoracic vertebral body. Localized spondylitis affecting the twelfth thoracic and first lumbar vertebrae was demonstrable. Lumbar puncture revealed yellow fluid, which coagulated, forming a massive clot, and contained a large excess of globulin but no increase in cells. Lipiodol *ascendens* was arrested at the first lumbar vertebra.

On March 19, 1930, the late Dr. Mervyn Stewart performed a laminectomy and removed a fibroblastic meningioma from within the *dura mater*.

Leaking of cerebro-spinal fluid was excessive after operation, and severe headache resulted, but otherwise rapid recovery ensued, and within one month the patient had recovered full use of his limbs, while control of the sphincters was regained within twenty-four hours.

The patient had been doing hard manual work for eighteen months without any ill effect.

Dr. Penington commented on the necessity for recognizing the frequent escape of the sacral segments and saddle area, the importance of localized spondylitis as indicative of the possible presence of a tumour, and the frequency with which visceral lesions were considered to be a cause of the symptoms, as occurred in this case prior to the patient's attendance at the Melbourne Hospital. Dissociation of temperature sensibility was of interest.

(To be continued.)

NOMINATIONS AND ELECTIONS.

THE undermentioned has been nominated for election as a member of the New South Wales Branch of the British Medical Association:

Starr, Kenneth William, M.B., B.S., 1930 (Univ. Sydney), Newcastle Hospital, Newcastle.

Correspondence.

THE USE OF IODINE IN THYREOTOXICOSIS.

SIR: I feel deeply indebted to my old teacher and friend, Dr. R. Scot Skirving, for the very kind remarks concerning the article on "The Use of Iodine in Thyreotoxicosis" which appeared under my name in this journal of September 23 last.

Trained as he was in the school of intensive personal clinical observation as contrasted with the present day laboratory domination, his comments should have added weight when considering the condition and welfare of the patient, and his remarks are very pertinent from this viewpoint.

He refers to Lugol's solution as being the best form in which to administer iodine because it has iodide of potassium as a constituent.

Potassium is a potent factor in the ability of the thyroïd gland to store iodine, hence the virtue of Lugol's solution.

I regret it was not clear that my preference for paraldehyde as a basal narcotic was for its administration *per rectum* and not *per os*, and I might point out that when shaken up with a little warm saline, its full effect seems more readily obtained than if given *per rectum* in an oily vehicle.

Dr. Scot Skirving has asked for my opinion regarding the anæsthetic to be used. This is a difficult question, as I feel each individual requires separate consideration, but for the average case I incline to a full dose of paraldehyde *per rectum* ninety minutes prior to operation following thirty minutes after a preliminary hypodermic injection of plain morphia, grain one-sixth to one-eighth.

A very light open ether is then given, sufficient to just keep the patient quiet, and it is surprising how little ether is necessary for this purpose.

In certain cases with serious cardiac conditions I use a local anæsthetic, possibly supplemented with a few drops of ether, and in nearly every case the full subtotal thyroïdectomy is performed at once.

As Dr. G. A. Sampson points out, thyroxine is a definite chemical compound, and it is incorrect to speak of a deficiency in its iodine content, but what I wished to infer was that in the building up of thyroxine itself a halt may occur at some stage short of the fully metamorphosed thyroxine molecule, and this substance acts as a toxin in the tissues.

Thyroxine is a tetra-iodo compound and non-toxic in normal amounts, whereas the di- or tri-iodo compounds elaborated short of the complete evolution of thyroxine itself seem to be toxic in very minute amounts.

Yours, etc.,

HUGH R. G. POATE.

225, Macquarie Street,
Sydney,
October 13, 1933.

VITAMIN DEFICIENCY.

SIR: A correlation of the undermentioned facts leads to but one inevitable conclusion and to one logical conclusion. The facts are as follows:

(1) The cancer death rate rose from 4 per 100,000 in 1869 to 45 per 100,000 in 1889 to 99 per 100,000 in 1930. The incidence of cancer per 100,000 must be considerably more than these figures. These figures are for Western Australia.

(2) The roller flour mill came into use about 1879 and with it the exclusion of vitamins and salts from bread.

(3) Within the last twenty or thirty years the consumption of tinned foods has increased enormously.

(4) "In vitamin B deficiency, carbohydrate metabolism cannot proceed normally and lactic acid accumulates" (L. J. Harris, *The British Medical Journal*, August 26, 1933).

(5) "It seems that iodine is a necessity in the chemical reactions which are responsible for the physiological activity of normal tissues" (H. R. G. Poate, *THE MEDICAL JOURNAL OF AUSTRALIA*, September 23, 1933).

(6) By feeding rats on diets deficient in vitamins cancerous and precancerous conditions have been produced (R. McCarrison, *The British Medical Journal*, June 6, 1931).

(7) It is common knowledge that vitamin D and calcium salts are intimately concerned in the formation of tooth and bone.

The inevitable conclusion to be drawn from the above facts is that there is an intimate connexion between vitamin deficiency and cancer. The logical conclusion is that there is an intimate connexion between vitamins and the correct use of salts in the body and that the normal

supply of internal secretions depends on a correct supply of salts.

Nature works on an endless chain; the sooner that fact is recognized the better.

Yours, etc.,

F. W. COTTON,

Lieutenant-Colonel, Royal Army
Medical Corps (Retired).

Roebourne,
Western Australia,
October 14, 1933.

DIAGNOSTIC SWABBINGS IN DIPHTHERIA.

SIR: I am still of the opinion that the taking of diagnostic throat swabs in suspected cases of diphtheria is useless from the therapeutic point of view, and my reasons for holding this opinion are clearly stated in Dr. R. Millard's letter. I fully agree with him that: "The results of swabbing are sometimes surprising. An obviously diphtheritic throat may give a negative and an innocent looking surface a positive result." If this be admitted, then surely it is advisable to give an injection of antitoxin at once, if the clinical appearances are suggestive of diphtheria, without awaiting the result of a swab, and also even if a negative result has been obtained and the diagnosis be still in doubt. I have seen death occur in more than one patient because antitoxin was withheld as the result of one or more negative swabs. If treatment be withheld until the diagnosis is made by bacteriological means, then a diagnostic swab is not only useless, but positively dangerous, and with this, I feel sure, Dr. Millard will agree.

For confirmation of the clinical diagnosis and for purposes of isolation and school attendance routine swabbings are essential. The omission of any reference to diphtheria in my paper was not due to revision or alteration of opinion. Too great a reliance on the results of diagnostic swabs (for purposes of treatment) was simply quoted as an illustration of the present tendency to place too much reliance on special diagnostic tests at the expense of the ordinary clinical examination and a carefully taken history. The paper was written for publication after it had been delivered.

Yours, etc.,

LESLIE E. HURLEY.

12, Collins Street,
Melbourne,
October 17, 1933.

"RUNNING EARS."

SIR: The treatment of chronic and of some subacute "running ears" by the insufflation of iodoboric powder as recommended by Scot-Stevenson and Watson Williams is simple and effective and worthy of extensive trial. The method briefly is as follows: The meatus (and as far as possible the middle ear) is thoroughly dried out by swabs. If "sticky" or dried secretion is difficult to remove by swabbing alone, the ear may be syringed with normal saline and then swabbed dry. The insufflator, which contains a mixture of 0.75% or 1% resublimated iodine in boric acid, is inserted well into the meatus. The ear is pulled slightly upwards and backwards and the powder blown in.

This is usually repeated two or three times weekly, but if, on commencement, the discharge is abundant it is done once daily.

As in other methods of treatment, the following are of importance:

(1) Asepsis. The skin of the entrance to the meatus is first wiped over with spirits, and the swabs must be sterile, that is, not made during the treatment, but previously made and steam sterilized in packets containing a convenient number.

(2) Attention to the mouth (teeth), throat and nose.
(3) Attention to the general health, not forgetting, especially in children, the vitamin content of the diet.

In my experience the results obtained by the use of this powder are superior to those obtained by other methods of treatment.

Yours, etc.,

ASHLEIGH O. DAVY.

143, Macquarie Street,
Sydney,
October 23, 1933.

TONSILLECTOMY.

SIR: As there has recently set in a more or less reasonable antagonism to the removal of tonsils and adenoids from children and as further varying measures have been advocated in place of operation, including that very safe but indefinite procedure called correct dieting, it occurred to me that some figures culled from records at the Hospital for Sick Children, Brisbane, might be of interest.

In case of doubt, it is necessary to point out that over the entire period in question there was no other institution for sick children here, so that it is reasonable to infer that at least a good proportion of the cases that did not return to the hospital subsequent to operation had no occasion to look for further relief.

The records cover a period of five consecutive years and are those of the same out-patient physician, who is noted for his very complete notes and clear writing. Of children over two years and under twelve, 225 were brought because they had been suffering from repeated "colds" or because they had had a cough or a "cold" for upwards of one month.

One hundred and ninety-one or, roughly, 85% were referred to the ear, nose and throat department. Sixty had their tonsils and adenoids removed, of whom 49 were over five years old; one child had adenectomy only. Of these 61 children, five reported to the physician after three months "marked improvement", one "improvement", three "no improvement", and 52 did not further attend either the medical or ear, nose and throat clinic. In Brisbane it is reasonable to suppose that in the main they did not attend for treatment elsewhere.

Many more children were advised to submit to operation, and probably many were operated on privately, owing to the necessity of waiting their turn at the hospital, sometimes a matter of several months. For the most part they did not again visit the hospital.

Of course, many of the rest of the 191 children had their noses operated on for sinus or other trouble, and quite a lot of these had their tonsils and adenoids removed also, but I am using the figures of the cases where no nose treatment was deemed necessary in the first instance, and they strongly suggest, I think, that the removal of tonsils and adenoids in children is decidedly beneficial to the child subject to "colds".

I incline to the belief that in lots of these cases adenectomy alone is sufficient, but that is another story.

Yours, etc.,

ARTHUR MURPHY.

Wickham Terrace,
Brisbane
(Undated).

Post-Graduate Work.

ANNUAL REFRESHER COURSE IN MELBOURNE.

MEMBERS of the British Medical Association are reminded that the annual refresher course, arranged by the Melbourne Permanent Post-Graduate Committee, will be held in Melbourne from November 13 to 25, 1933. A post-graduate course in obstetrics will be held concurrently with the annual refresher course. Details of these courses were published in THE MEDICAL JOURNAL OF AUSTRALIA of September 23, 1933.

COURSE IN OPHTHALMOLOGY.

THE New South Wales Permanent Post-Graduate Committee announces that the list for the special course in ophthalmology to be held in Sydney from November 6, 1933, is now full. No further applications can be accepted.

Obituary.

CHARLES FRANK WARREN.

We regret to announce the death of Dr. Charles Frank Warren, which occurred on October 23, 1933, at Yokohama, Japan.

Books Received.

THERAPEUTIC USES OF INFRA-RED RAYS, by W. A. Troup, M.B., Ch.B., with foreword by Sir William Willcox, K.C.I.B., C.B., C.M.G., M.D., F.R.C.P.; Second Edition; 1933. London: The Actinic Press, Limited. Demy 8vo., pp. 90, with illustrations. Price: 6s. 6d. net.

THE ADRENAL CORTEX: A SURGICAL AND PATHOLOGICAL STUDY, by L. R. Broster, O.B.E., M.A., D.M., M.Ch., F.R.C.S., and H. W. C. Vines, M.A., M.D.; 1933. London: H. K. Lewis and Company, Limited. Demy 8vo., pp. 94, with illustrations. Price: 6s. net.

AIDS TO PATHOLOGICAL TECHNIQUE, by D. H. Haler, M.B., B.S.; 1933. London: Baillière, Tindall and Cox. Foolscep 8vo., pp. 193, with illustrations. Price: 3s. 6d. net.

Diary for the Month.

- Nov. 6.—New South Wales Branch, B.M.A.: Organization and Science Committee.
 Nov. 9.—Victorian Branch, B.M.A.: Special Council Meeting.
 Nov. 10.—Queensland Branch, B.M.A.: Council.
 Nov. 14.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
 Nov. 15.—Western Australian Branch, B.M.A.: Branch.
 Nov. 21.—New South Wales Branch, B.M.A.: Ethics Committee.
 Nov. 22.—Victorian Branch, B.M.A.: Clinical Meeting.
 Nov. 23.—New South Wales Branch, B.M.A.: Clinical Meeting.
 Nov. 24.—Queensland Branch, B.M.A.: Council.
 Nov. 28.—New South Wales Branch, B.M.A.: Medical Politics Committee.
 Nov. 29.—Victorian Branch, B.M.A.: Council Meeting.
 Nov. 30.—New South Wales Branch, B.M.A.: Branch.

Medical Appointments.

Dr. H. L. Considine (B.M.A.) has been appointed Government Medical Officer at Ganmain, New South Wales.

Dr. B. Van Someren (B.M.A.) has been temporarily appointed Medical Officer, Medical Branch, Department of Education, New South Wales.

Medical Appointments Vacant, etc.

For announcements of medical appointments vacant, assistants, locum tenentes sought, etc., see "Advertiser", pages xvi and xvii

- CHILDREN'S HOSPITAL (INCORPORATED), PERTH, WESTERN AUSTRALIA: Junior Resident Medical Officers.
 HOBART PUBLIC HOSPITAL, HOBART, TASMANIA: Junior Resident Medical Officers.
 MARRICKVILLE DISTRICT HOSPITAL, SYDNEY, NEW SOUTH WALES: Junior Resident Medical Officer.
 PARRAMATTA DISTRICT HOSPITAL, PARRAMATTA, NEW SOUTH WALES: Junior Resident Medical Officer.
 ROYAL ALEXANDRA HOSPITAL FOR CHILDREN, SYDNEY, NEW SOUTH WALES: Honorary Clinical Assistant.
 ROYAL NORTH SHORE HOSPITAL OF SYDNEY, NEW SOUTH WALES: Honorary Officers.

Medical Appointments: Important Notice.

MEDICAL practitioners are requested not to apply for any appointment referred to in the following table, without having first communicated with the Honorary Secretary of the Branch named in the first column, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

| BRANCH | APPOINTMENTS. |
|--|---|
| NEW SOUTH WALES: Honorary Secretary, 135, Macquarie Street, Sydney. | Australian Natives' Association. Ashfield and District United Friendly Societies' Dispensary. Balmain United Friendly Societies' Dispensary. Friendly Society Lodges at Casino. Leichhardt and Petersham United Friendly Societies' Dispensary. Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney. North Sydney Friendly Societies' Dispensary Limited. People's Prudential Assurance Company Limited. Phoenix Mutual Provident Society. |
| VICTORIAN: Honorary Secretary, Medical Society Hall, East Melbourne. | All Institutes or Medical Dispensaries. Australian Prudential Association, Proprietary, Limited. Mutual National Provident Club. National Provident Association. Hospital or other appointments outside Victoria. |
| QUEENSLAND: Honorary Secretary, B.M.A. Building, Adelaide Street, Brisbane. | Brisbane Associated Friendly Societies' Medical Institute. Chillagoe Hospital. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL are advised, in their own interests, to submit a copy of their agreement to the Council before signing. Lower Burdekin District Hospital, Ayr. |
| SOUTH AUSTRALIAN: Secretary, 307, North Terrace, Adelaide. | Combined Friendly Societies, Clarendon and Kangarilla districts. All Lodge Appointments in South Australia. All Contract Practice Appointments in South Australia. |
| WESTERN AUSTRALIAN: Honorary Secretary, 65, Saint George's Terrace, Perth. | All Contract Practice Appointments in Western Australia. |
| NEW ZEALAND (Wellington Division): Honorary Secretary, Wellington. | Friendly Society Lodges, Wellington, New Zealand. |

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

All communications should be addressed to "The Editor", THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, New South Wales. (Telephones: MW 2651-2.)

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